FOUNDRY TRADE JOURNAL

EST. 1902

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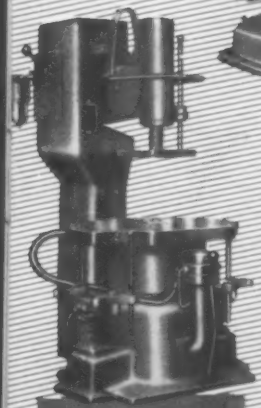
THE SPECIALISTS IN MOULDING MACHINES

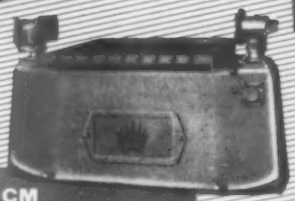
BQ *Automatic simultaneous jolt-squeeze machines which are raising production records wherever installed. Fastest yet most flexible.*

BT *Most modern and trouble free turnover machines available. Automatic timer, automatic anvil and automatic mould removal.*

AT *Fast turnover type machines with 6 ins., 9 ins. or 12 ins. pattern draw. Larger sizes (type R.D.) also available.*

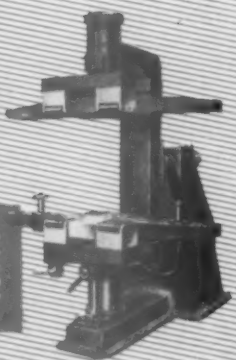
SF *Pneumatic squeeze snap-flask machines with or without jolt.*





CM *Useful machines to speed the production of repetition cores. For coreboxes up to 60 ins. long.*

HPL *Easy to operate but very fast. Jolt squeeze and pinlift, 3 sizes available.*



BA *Machines for turning over and stripping all cores rammed or blown in the average coreshop.*

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Rotary Core Machines

The secret of good casting

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have pleasure in announcing the opening of their new fully-mechanised

BLACKHEART MALLEABLE IRON FOUNDRY

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Ferritic and Pearlitic grades of Blackheart Malleable Iron
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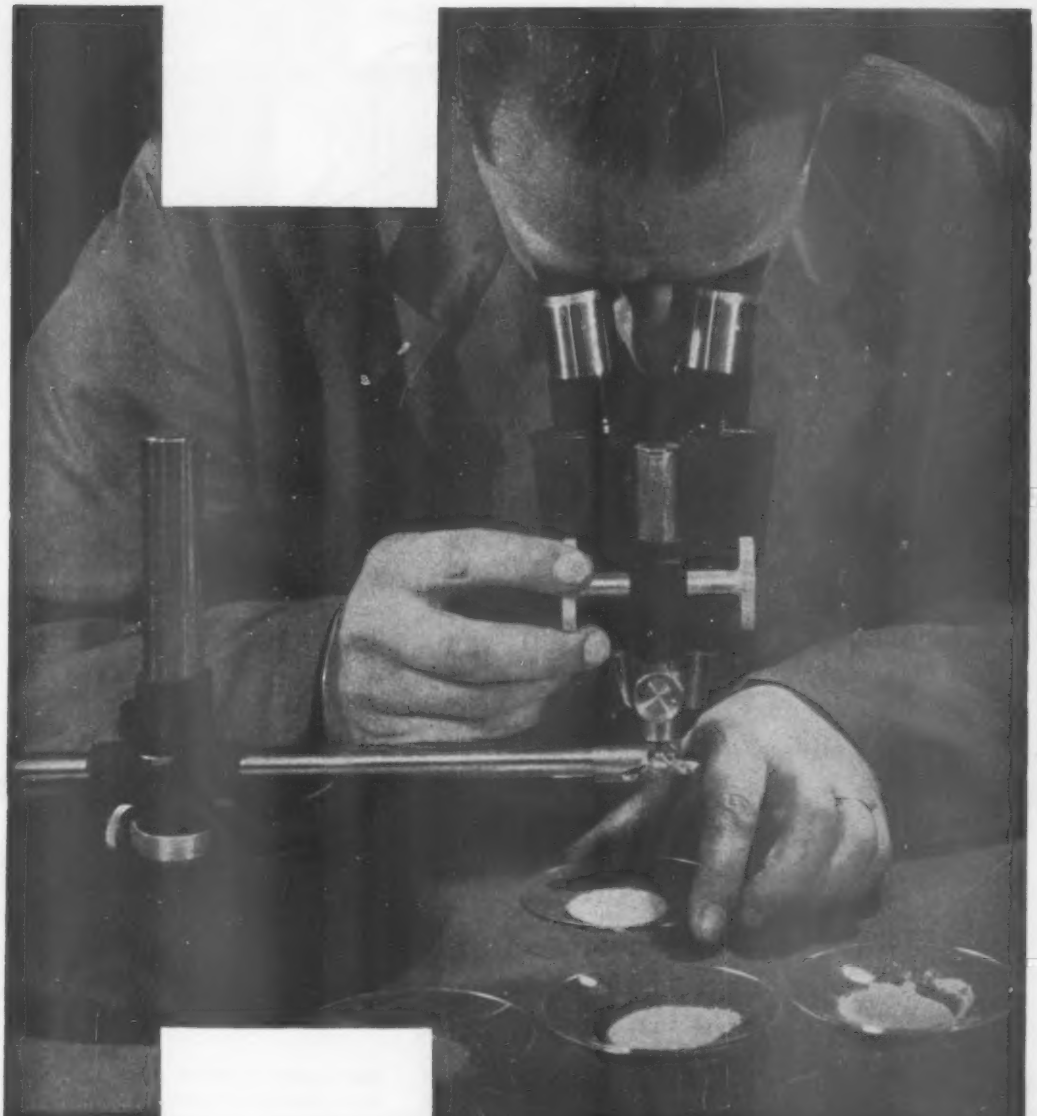

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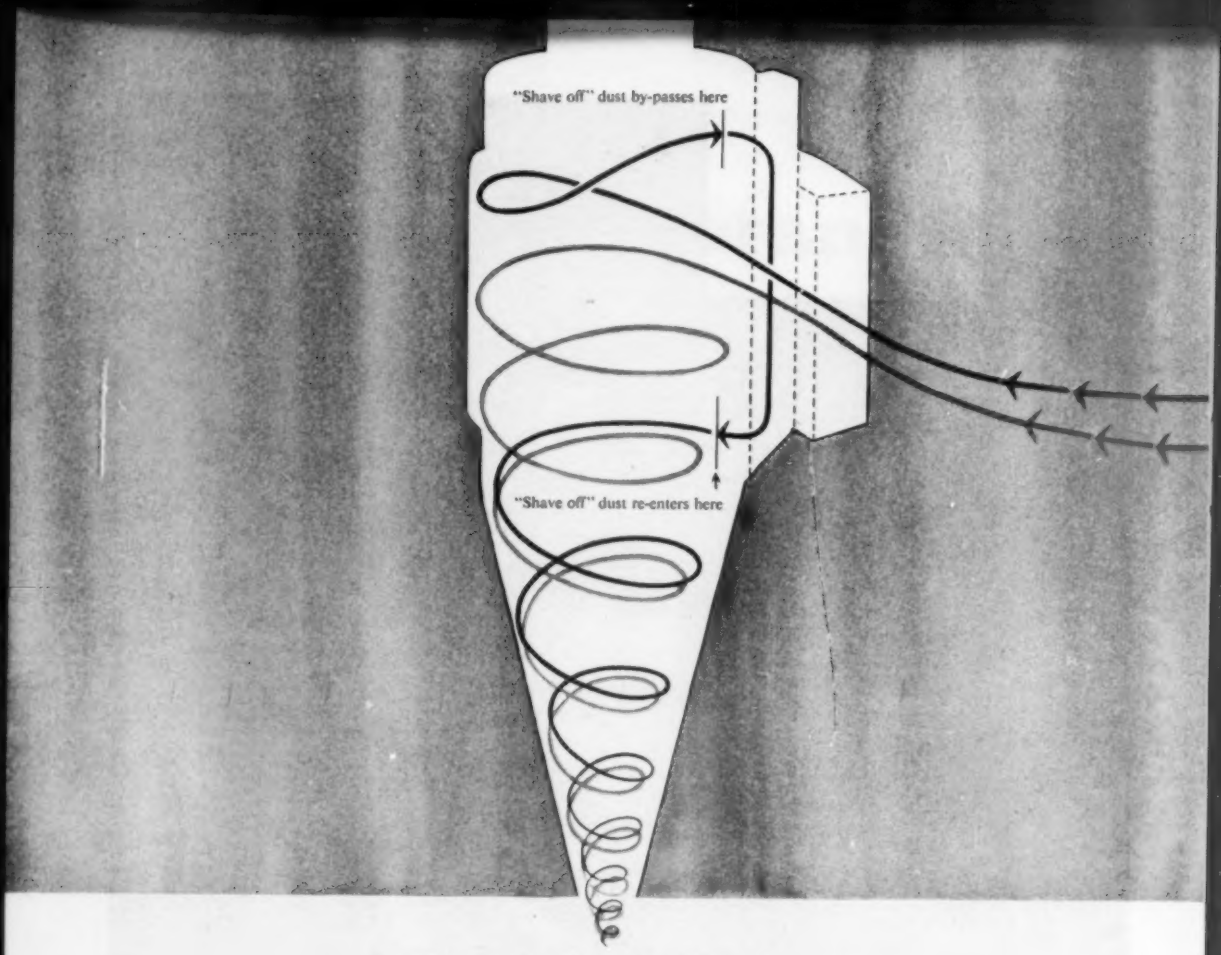

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The AMBUCO method of guaranteed efficiency offers you the following unique advantages:

1. **We analyse** the size, shape, porosity, density, specific gravity, acceleration, etc. of particles and gases to be separated.
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3. **The "shave off"** achieves considerable improvement in the rate of recovery because the dust caught in the "double eddy" current is forced through the "shave off" port (see illustration) and conducted through a by-pass duct into the main volume of dust.

Dust control is our sole concern. Our engineering and design service is fully equipped to deal with all dust control and recovery problems employing cyclones, scrubbers, grit arresters, fabric dust collectors and other equipment.

For technical literature on the Ambuco Cyclones please ring HYDe Park 2178 or write to AMBUCO LIMITED, Standbrook House, 2/5 Old Bond Street, London, W.1.

AMBUCO put dust in its place

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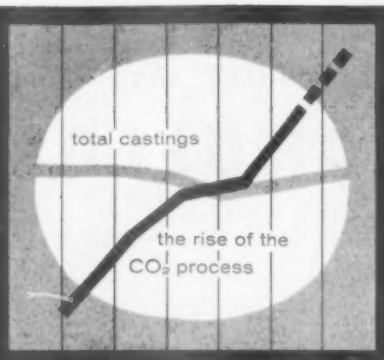

the economy of the CO_2 process for making better cores and moulds faster

HARD AND FAST FACTS 2

DCL C2

The economy of the CO_2 sodium silicate core and mould forming process is due to its utter simplicity. A single sand mix is used for both cores and moulds. This *unit sand* is not only cheaper, but also saves the costs involved in mixing and testing separate sand batches. Hours of stove drying and cooling are completely replaced by a CO_2 injection lasting only a few seconds. This saves fuel, stove maintenance, cranage and waiting, and speeds up mould box turn round. Further economies follow from the higher casting yields offered by the CO_2 process. Substantially more castings of greater dimensional accuracy and finish can be produced in the same floor space, and all this with the simplest equipment. For full details of the economies, productivity and quality control made possible by the CO_2 process, write to:

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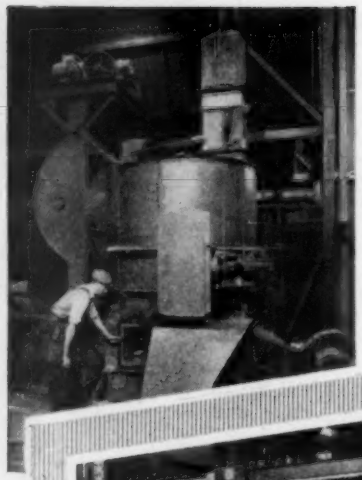
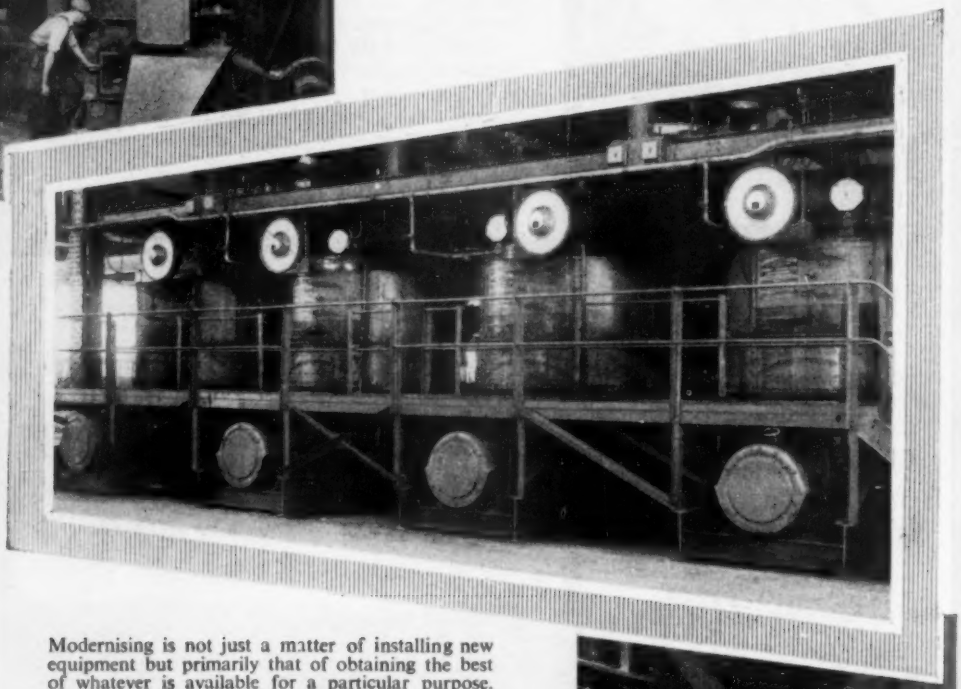


More and more modern foundries

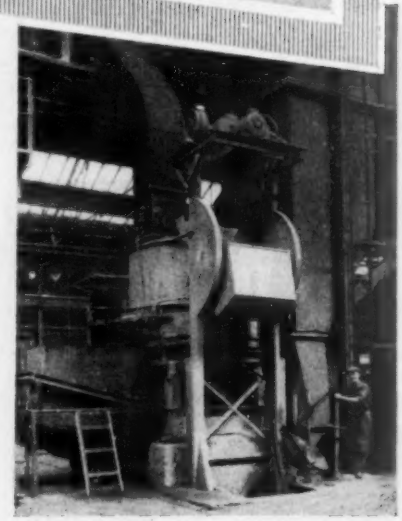
are specifying the

*SPEED*MULLOR

to mull their mould or core sand



Modernising is not just a matter of installing new equipment but primarily that of obtaining the best of whatever is available for a particular purpose. That is why more and more modern foundries choose the Speedmullor for the preparation of their sand. One single foundry in this country operates 10 Speedmullors and one multiple company uses 14. More foundry sand is mulled in Speedmullors than by any other method because, only Speedmullor mulling can develop the full physical properties of moulding sand and core sand mixtures with minimum bond and at lowest cost per ton of sand mulled. Full development of physical properties with maximum Speedmullor uniformity and control provides higher quality castings with better surface finish and the elimination of casting defects.



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STEEL AGE IN MINIATURE

Steel is the sinews of bridges and skyscrapers. But it is just as essential when things have to be made very small. It can be formed very accurately into shapes of insect-like delicacy, yet still retain the proverbial strength of steel.

Nowadays more and more things are tending to shrink in size. This is sometimes the result of new technical requirements: the midget ball-race shown above is typical of the tiny parts used in space vehicles.

Steel has many advantages for small-scale work. It can be shaped while relatively soft, and then hardened. It comes in almost any required combination of springiness, toughness or stretchability. Whether you are making a 1000 foot television mast or a screw 1/25th inch long, steel is the best material for the job.

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2 Watch escape wheel
3 Countersunk watch screw 1·05 mm. long
4 Intermediate wheel from watch
5 Watch escapement lever
6 Hairspring from watch
7 Steel balls 0·5 mm. in diameter
8 Balance staff of watch
9 Stainless steel wire 0·0015" in diameter
10 Match head to show scale

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BRITISH IRON AND STEEL FEDERATION

Eagle Owl by John Markham F.R.P.S., F.Z.S.

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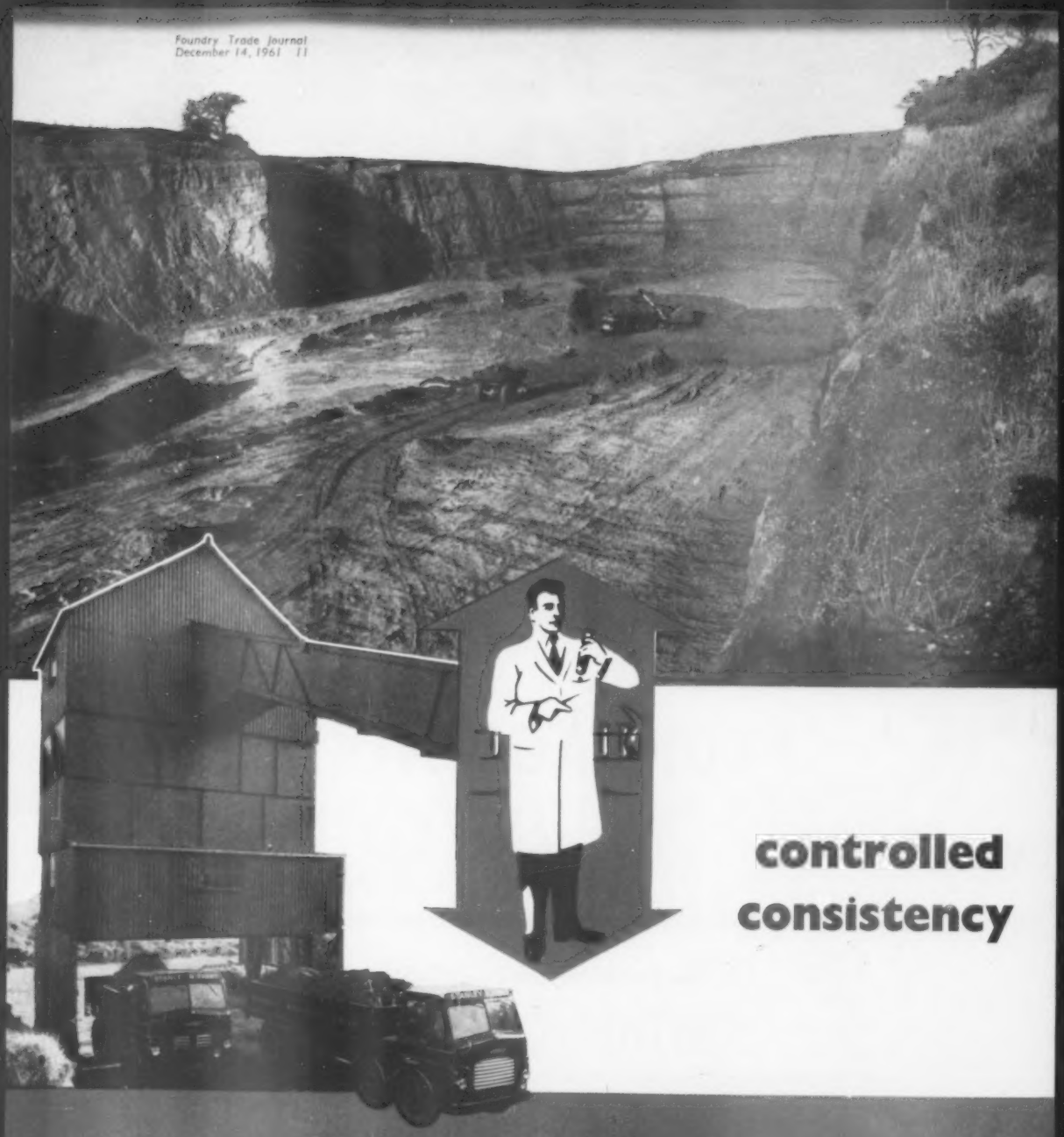

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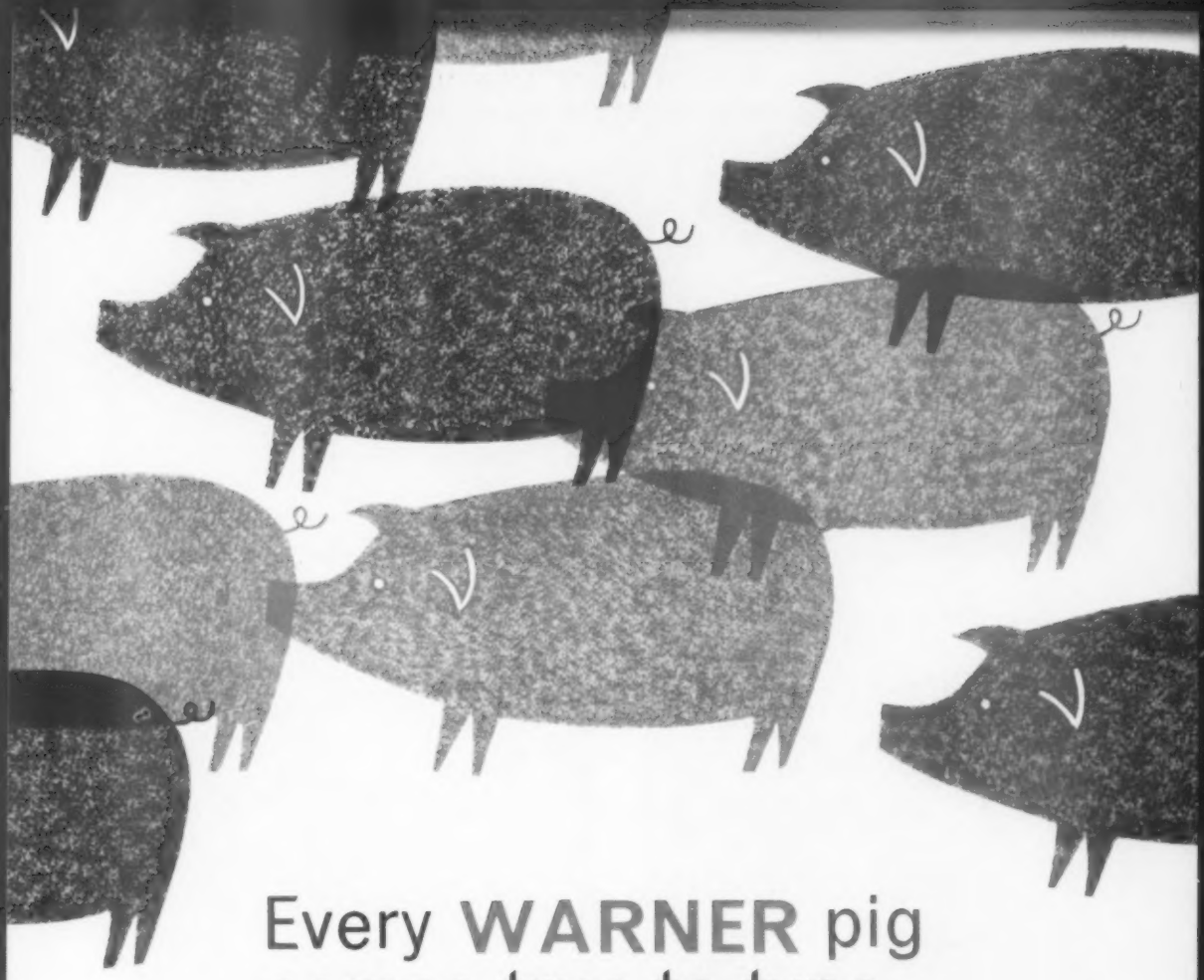

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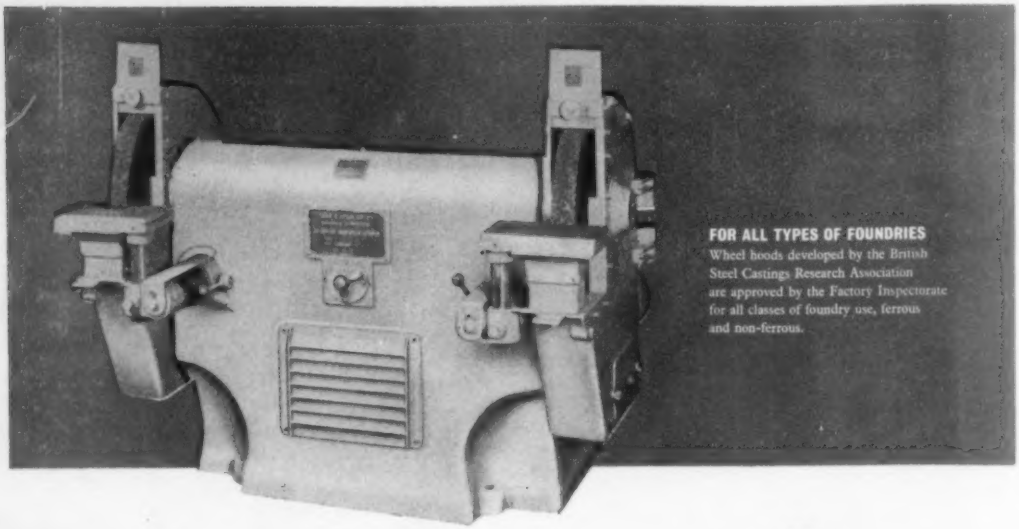
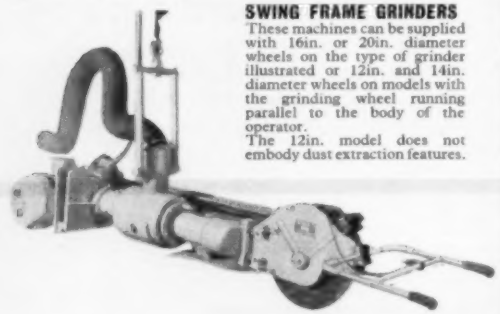


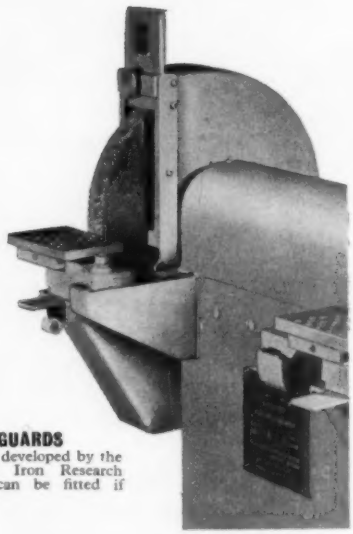
FOR ALL TYPES OF FOUNDRIES
Wheel hoods developed by the British Steel Castings Research Association are approved by the Factory Inspectorate for all classes of foundry use, ferrous and non-ferrous.

HIGH EFFICIENCY GRINDING COMBINED WITH HIGH EFFICIENCY DUST EXTRACTION

PEDESTAL GRINDERS
Luke & Spencer manufacture a large range of pedestal and swing frame grinders which incorporate the latest developments in efficient dust extraction.
Single or double ended pedestal grinders can be supplied with wheels ranging from 12 inches to 36 inches diameter.

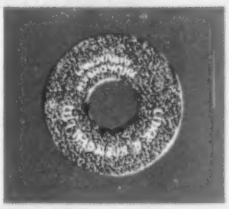


SWING FRAME GRINDERS
These machines can be supplied with 16in. or 20in. diameter wheels on the type of grinder illustrated or 12in. and 14in. diameter wheels on models with the grinding wheel running parallel to the body of the operator.
The 12in. model does not embody dust extraction features.



B.S.C.R.A. GUARDS
Wheel hoods developed by the British Cast Iron Research Association can be fitted if desired.

ABRASIVE WHEELS
For High Speed and Normal Speed use. For Snagging and Precision grinding.
Luke & Spencer produce a full range of abrasive wheels under our trade names "Borolite", "Victramic", "Lukspenite".
These cover resinoid, vitrified, rubber, shellac and silicate bonds.



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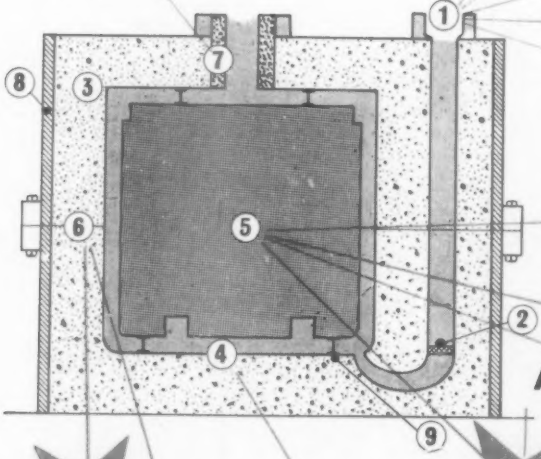

Key to Sectional Drawing of Mould

		Send for booklet No.
1	Metallurgical Control use of Fluxes	3
2	Clean Metal by using Ceramic Strainer Cores and Discs	4
3	Coal Dust additional to Facing and Backing Sand	1
4	Silverskin Blackings, Plumbago and Mould Dressings.	1
5	Cores using Crulin and Crudol Core Binders (Oil Bonded, Air Setting Cereal or CO.2 Binders).	2
6	Moulds Parted with Beecro Silica Free Parting Powder or Beecrol Parting Liquid.	1
7	Casting Feeding with Alsica Exothermic Feeder Heads.	4
8	Moulding Boxes supplied by B.F.U. Chaplets, Studs, etc.	5

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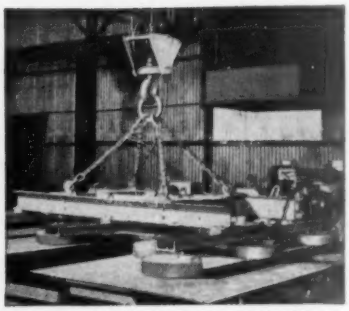
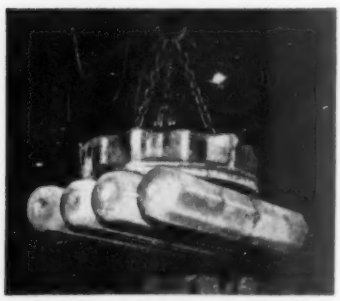
There are Witton-Kramer lifting magnets of all types to help you reduce your handling costs. Modern design and robust construction ensure their long life under severe operating conditions. That is why so many are being supplied for such a variety of duties.



A group of lifting magnets at the Manor Works of Joseph Sankey & Sons handling plates for the magnet yoke of a 7000 MeV proton-synchrotron.

Lifting pig iron at Round Oak Steelworks Ltd.



Lifting four ingots at the works of Taylor Brothers & Co. Ltd., Trafford Park. The total lift is about 13,440 lbs.

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889

OA/7449

The heart of a good, clean casting

Here's a sand mix with "green strength" and flowability in a nice balance — a good start towards a casting that needs minimum "after foundry" treatment. It owes much to the mixer's skill of course. But he'll be the first to tell you that the key factor is the choice of a binder — one that will give the finished core its qualities of smoothness, permeability and so on.

It is this part of the complex foundry operation that Askes have made their sole business, and as a result offer the comprehensive "Baltiseed" range of bonding media. Oil, cereal and emulsion binders. Synthetic resins. Facing materials. Silicates for the CO_2 process. And new compounds are continually under test in the laboratory.

All Aske products are stocked under a warehouse system that puts every foundryman within fifty miles of a source of supply. They're backed by expert technical representation, too, that's yours for the price of a 'phone call.

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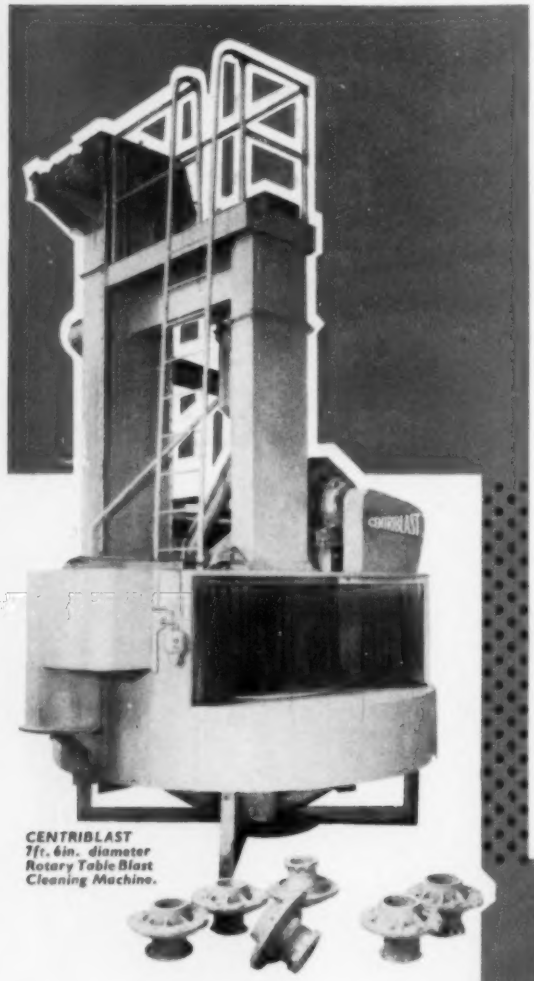

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7ft. 6in. diameter
Rotary Table Blast
Cleaning Machine.

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OF CASTINGS IN . . .

MONOMAL®

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BLACKHEART MALLEABLE
IRON FOUNDRY

GKN (Cwmbran) Ltd.

HAVE ENSURED
THOROUGH CLEANING
AND FINE FINISH BY
THE EMPLOYMENT OF . . .

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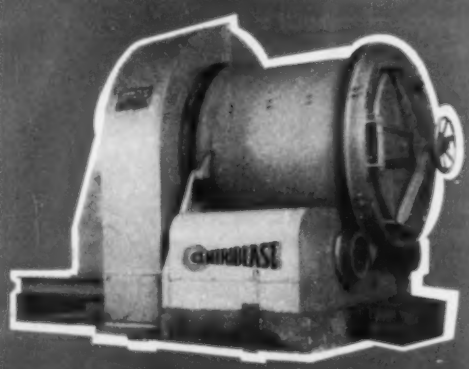

We are proud to have been associated with this new venture and we wish G K N (Cwmbran) Ltd., every success.

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Cleaning Machine.

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It grinds ★ sands ★ polishes ★

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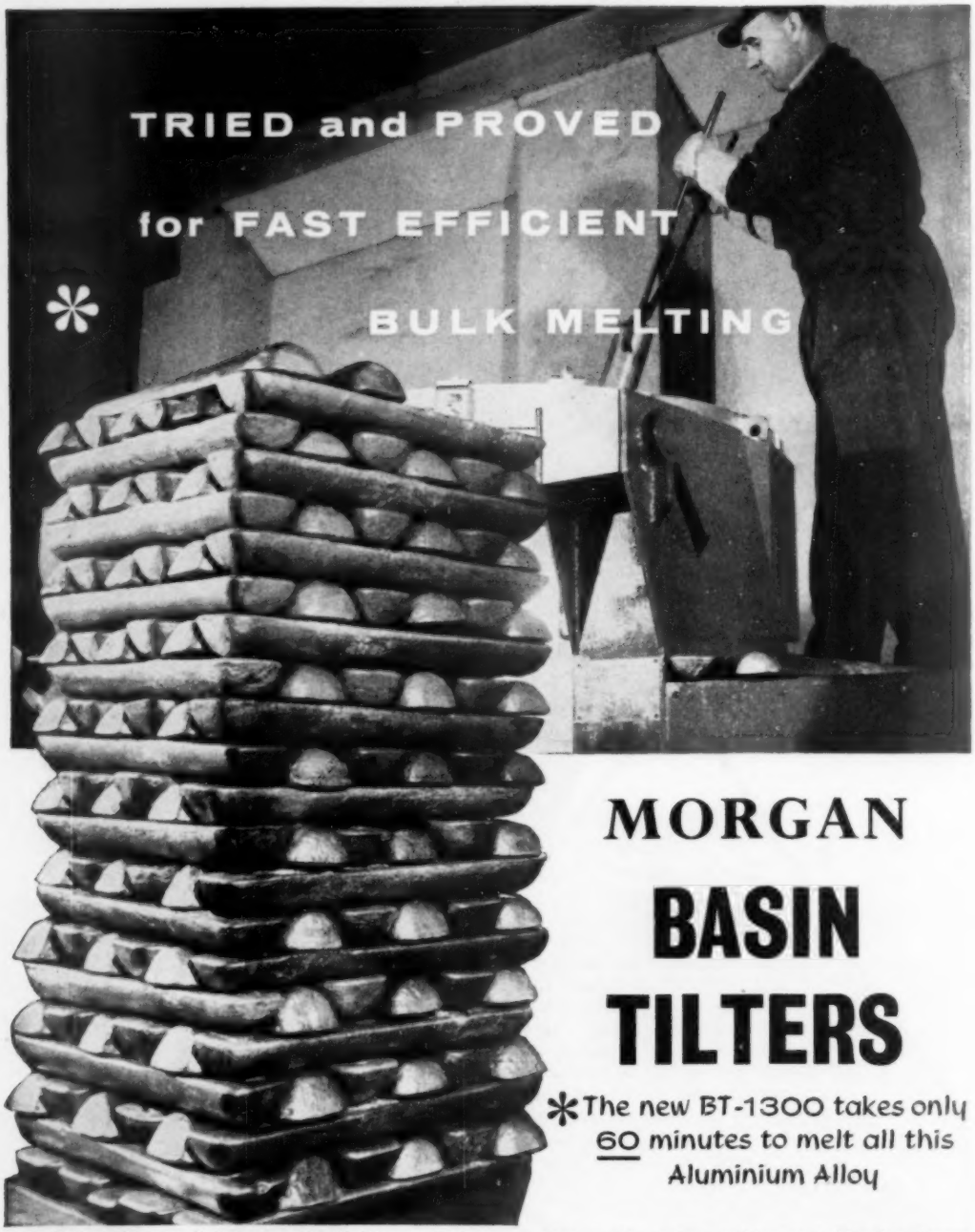

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F54A

DESIGN and ACHIEVEMENT

EVERY FOUNDRY HAS ITS OWN PROBLEMS...

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Photograph by courtesy of G.K.N. (CWMBRAN) LTD

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METALS & EQUIPMENT LTD.

DRAYTON STREET, WOLVERHAMPTON

Telephone: WOL 23581 Telegrams: METAQUIP.

EVERY SCHOOLBOY KNOWS WHAT HAPPENS

We may not agree with Macaulay that "every schoolboy knows who imprisoned Montezuma"; but if any schoolboy does not know what happens when little acorns are properly planted and tended, let him have a look at GKN (Cwmbran) Ltd., where the great oak is still growing.

In the same building where cannonballs were cast for the Crimean War, we are today producing Petrol and Diesel engine camshafts. Nearby, we are making all the London Transport Executive's requirements of cable brackets, as well as large quantities of railway chairs and baseplates. Our 'Mon-O-Cyl' cylinder heads and blocks are famous throughout the motor industry: and now the name 'Mon-O-Cyl' has its counterpart in malleable iron: 'Mon-O-Mal'.

GKN (Cwmbran) Ltd. have just opened a fully-mechanised blackheart malleable iron foundry, which has the capacity for maximum production runs of castings in 'Mon-O-Mal' ferritic and pearlitic blackheart malleable iron. It is the most up-to-date installation in the country. It is also a sign that the great oak is continuing to spread.

GKN (Cwmbran) Ltd. is one of over 80 independent companies in the GKN Group. These companies are concerned mainly with steel in all its forms and all its aspects, and there is virtually nothing in steel that is outside their scope. What one GKN company cannot do, another can; and what all can do is to provide a service in steel as complete as you will find anywhere.

Guest, Keen and Nettlefolds, Ltd., Head Office, London Works, Smethwick 40, Staffs.

Congratulations to GKN (Cwmbran) Ltd. on their new

MONOMAL®

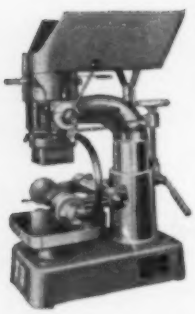
foundry, for which we carried out excavation and concreting for pits and equipment bases, together with brickwork for incidental buildings.

A. V. PETERSON & SONS LTD.

BUILDING AND CIVIL ENGINEERING CONTRACTORS, TURNPIKE YARD, LLANYRAVON, CWMBRAN, MON.

HANSBERG Coreshooters

For Denser Cores and Faster Production



TYPE H 2lbs.

Extended core box life.
Minimum venting problems.
Minimum air consumption.

ROY EVANS M.I.B.F.
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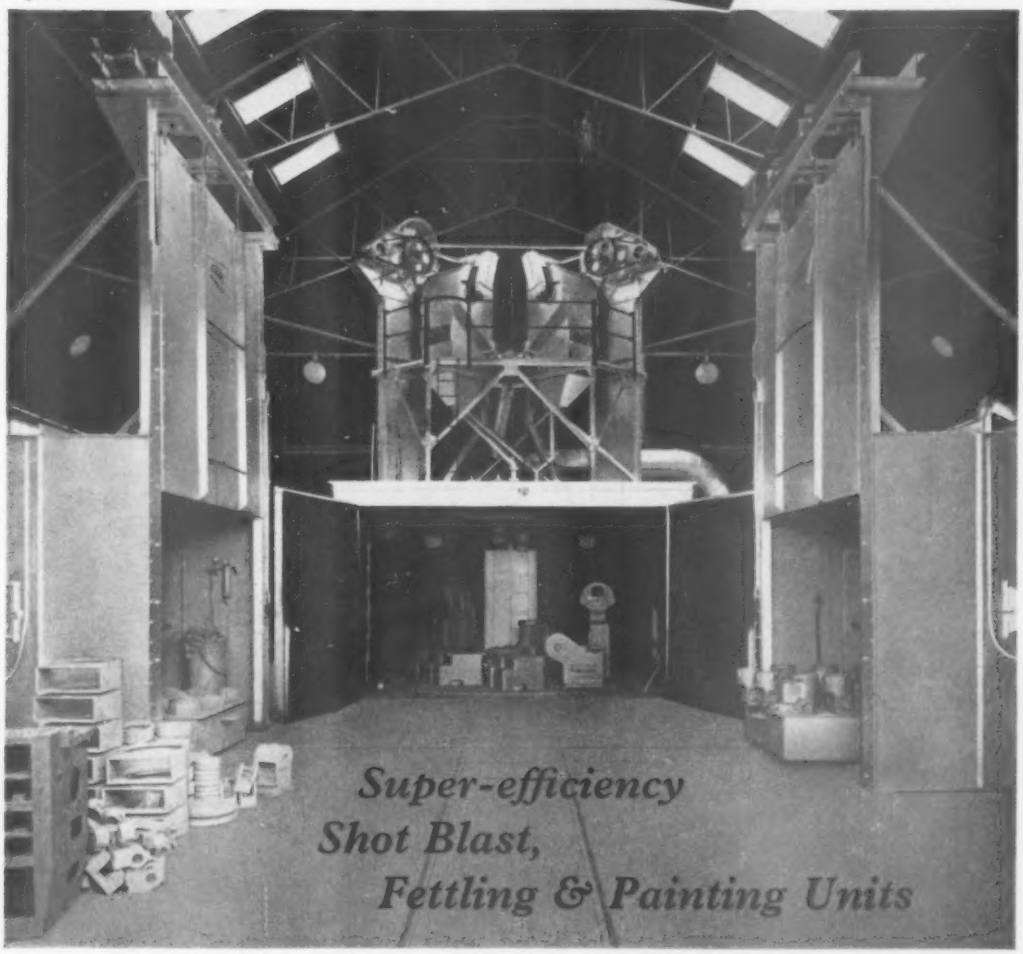
Telephone: CHELTENHAM 55105.
Patented and Mfd. by Off. Mecc. FRITZ HANSBURG Modena, Italy.

H5A, H12A, H25A, H80,
17-260lbs.
Automatic Oil-pneumatic

TILGHMAN'S LIMITED

T 518 A



Medium duty Room/Rotary Table Wheelabrator Cleaning Plant with 12ft. dia. Table and combined Fettling and Spray-painting Units supplied complete by TILGHMAN'S LIMITED to Messrs. James Archdale & Co. Ltd., Worcester, for the preparation and cleaning of machine tool castings up to a maximum weight of 25 tons.

TILGHMAN'S LTD. SG *BROADHEATH, ALTRINCHAM, CHESHIRE*

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FASTER FINER FINISHING WITH

Morrisflex

TUNGSTEN CARBIDE ROTARY CUTTERS

also

ROTARY CUTTERS AND FILES IN TOOL STEEL AND HIGH SPEED STEEL

and

ABRASIVE MOUNTED POINTS

Morrisflex Tungsten Burrs are now essential tools in the manufacture of dies, moulds, press tools, aircraft engine parts, Atomic Plant components and in many other fields where hard and difficult materials are worked: they are also particularly successful in dealing with Fibre Glass, which is notoriously damaging to conventional tools. A large range of standard burrs in Tool Steel, and HSS is also available, together with a great variety of follow up tools for grinding and polishing.

Mounted Points in Aluminous Oxide and Silicon Carbide. All shapes stocked.

Our new High Speed Drum Sanders make all other types obsolete.

GRASSO

Sole U.K. Distributors of Grasso Diegrinders, Drills, and many other Air Tools.

B. O. MORRIS LIMITED,
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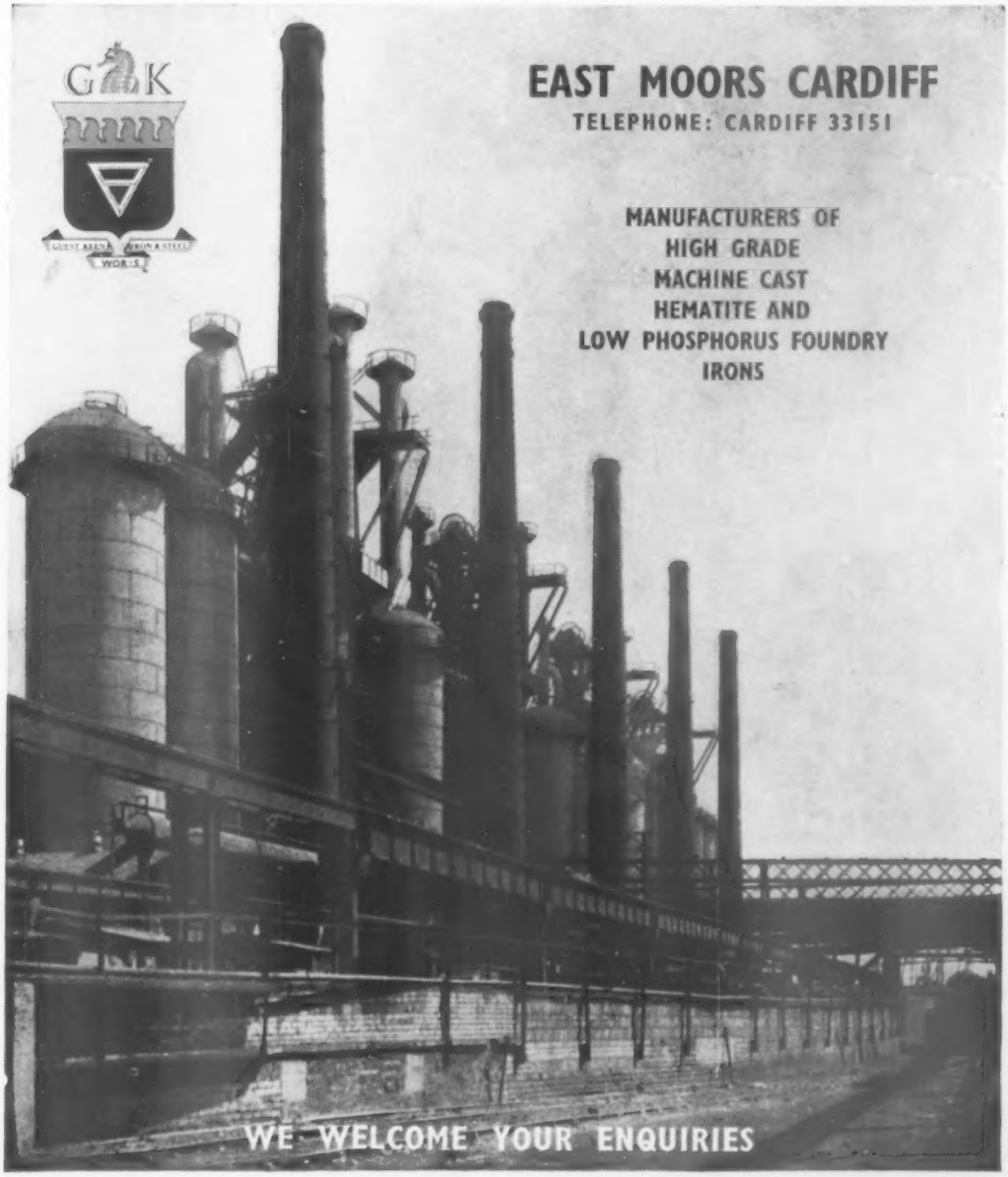
GUEST KEEN IRON & STEEL WORKS

(Branch of G.K.N. Steel Company Limited)

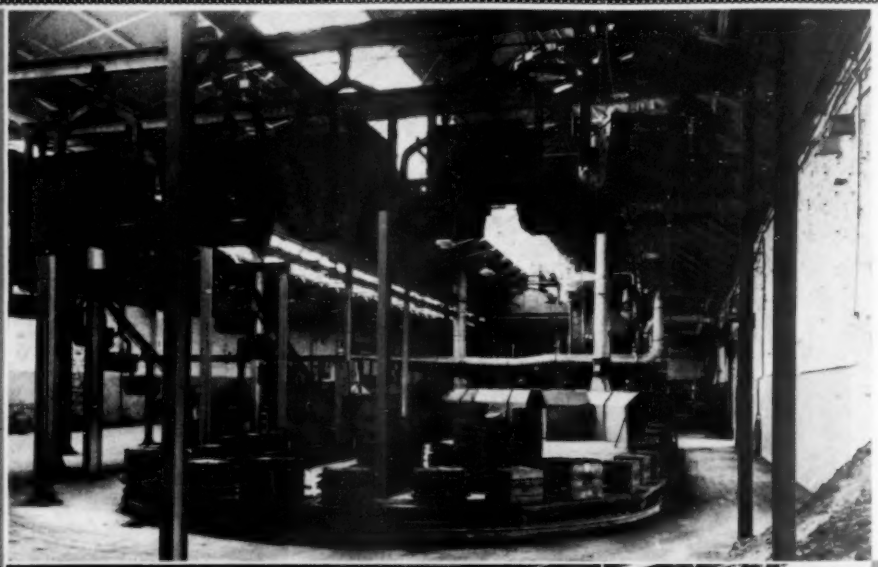


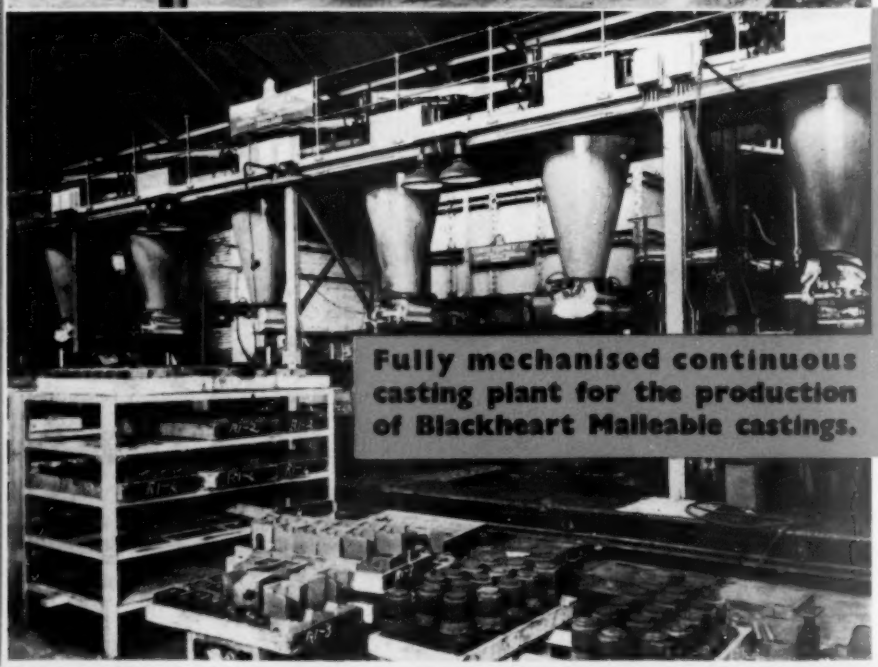
A FREE METALLURGICAL SERVICE IS AVAILABLE AND YOU ARE INVITED TO CONSULT US ON ANY FOUNDRY PROBLEMS

B

F.E. FOR FOUNDRY EQUIPMENT . . .

ALL PHOTOGRAPHS REPRODUCED BY THE COURTESY OF GUEST KEEN & NETTLEFOLDS (CWMBRAN) LTD., CWMBRAN, SOUTH WALES.



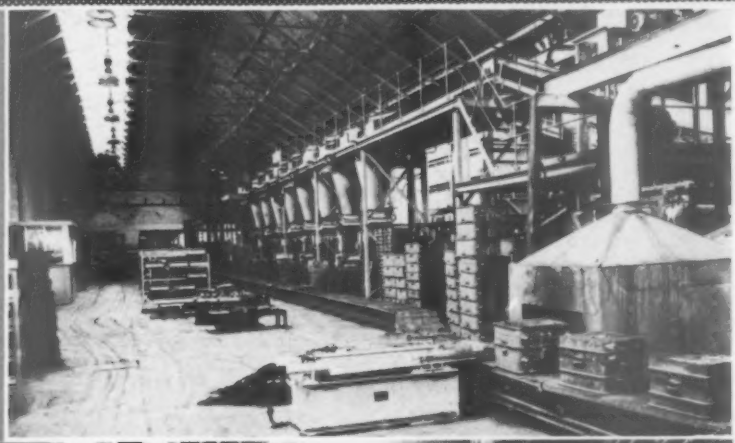


Fully mechanised continuous casting plant for the production of Blackheart Malleable castings.

FE FOR FOUNDRY EFFICIENCY TRADE MARK

FOUNDRY EQUIPMENT
LIMITED
Leighton Buzzard, Bedfordshire, England
Telephone: Leighton Buzzard 2441 (5 lines) Telegrams: 'Equipment,' Leighton Buzzard, England

.. GKN FOR MONOMAL®



FULLY MECHANISED BLACKHEART MALLEABLE IRON FOUNDRY

Designed, engineered and installed by the Foundry Equipment Group. Plant comprises 30 tons per hour continuous sand plant, mould conveyor automatic shakeout and modern mechanical handling equipment.

OVERSEAS COMPANIES:
AUSTRALIA: Foundry Equipment (Australia) Pty. Ltd., Elizabeth, S. Australia.
CANADA: F. E. (North America) Ltd., Toronto.
SOUTH AFRICA: F. E. (South Africa) (Pty.) Ltd., Johannesburg.
SPAIN: "Foundry Equipment" Comercial Espanola, S.A., Madrid.
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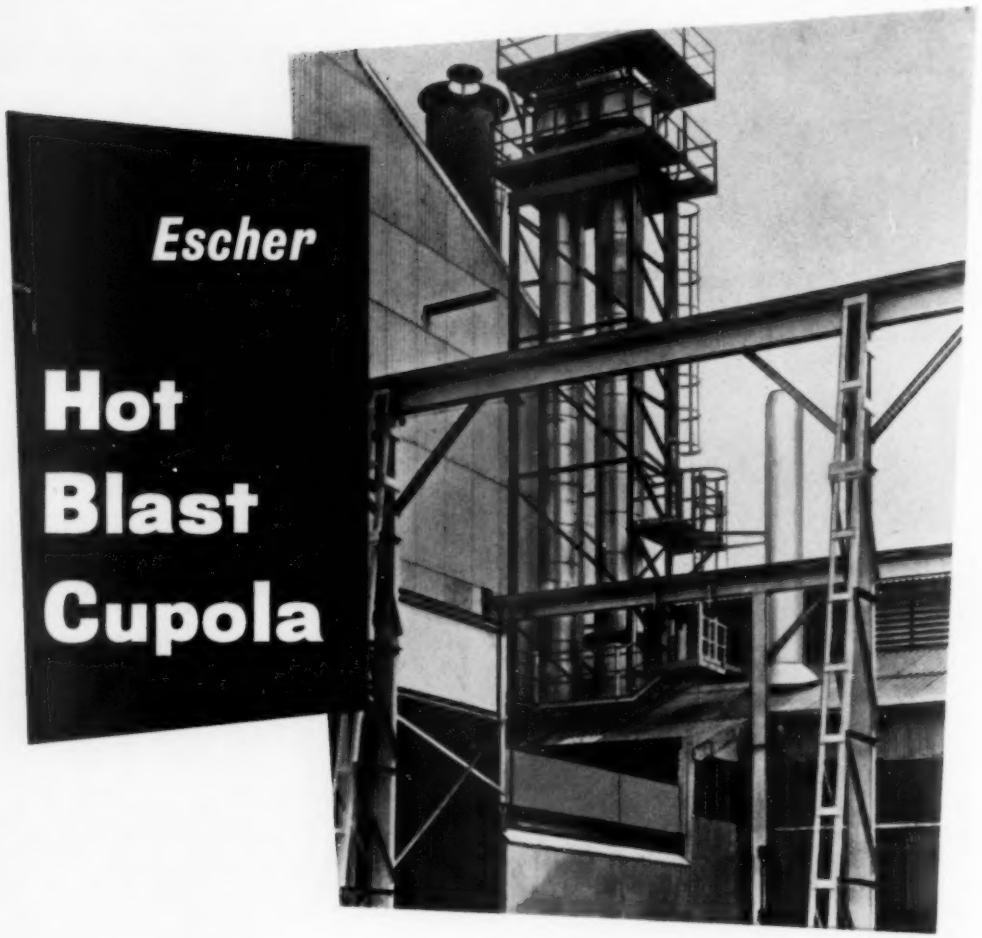


(Courtesy of International Harvester, Australia)
External view of recuperator of Escher H.B. installation, output 10-ton/hour. Customer reports one cleaning and no maintenance in five years daily operation.

Four Escher H.B. Installations are now in operation, with outputs from 6 to 17-ton/hour Three more, with outputs of 15 and 25-ton/hour, are due to be started up later this year, including a British installation.

Principal advantages of the Escher H.B. system are.

Starting from cold is simple and quick.

No cleaning necessary.

Up to 100% of top gas can be utilised, including blow-down period.

Cupola can be operated with acid, basic or neutral slag.

Simple, water-cooled, long-life tuyeres are used.

Water-cooled jackets reduce lining and maintenance cost.

Vertical recuperator lends itself to a compact and economical layout reducing installation cost.

Cyclone-shaped combustion chamber, acts as dust-catcher.

Less dust carried into the atmosphere.

Higher metal temperature and reduced water-cooling losses.

FAME

FOUNDRY & METALLURGICAL EQUIPMENT CO. LTD.

QUEENS ROAD · WEYBRIDGE · SURREY Weybridge 3091

Associated with Efco Ltd. and Stein & Atkinson Ltd.

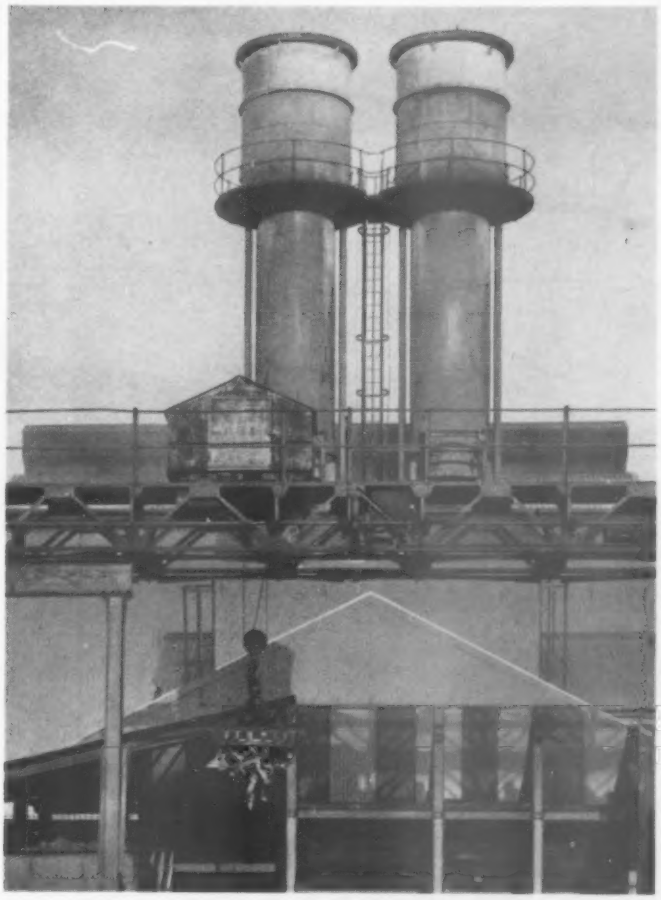
INCANDESCENT

Foundry Plant

at the new

GKN

Malleable Foundry Cwmbran



INCANDESCENT designed and built the melting plant for the GKN (Cwmbran) Ltd. fully-mechanised foundry now producing MONOMAL Blackheart Malleable Iron Castings. Each of the two INCANDESCENT cupolas has a melting rate of 8 tons per hour and is fitted with a dust arrester and charged by independant skip hoists.

Foundry Plant Division

THE INCANDESCENT HEAT CO. LTD., SMETHWICK, ENGLAND

Manufacturing representatives of The Whiting Corporation, U.S.A.

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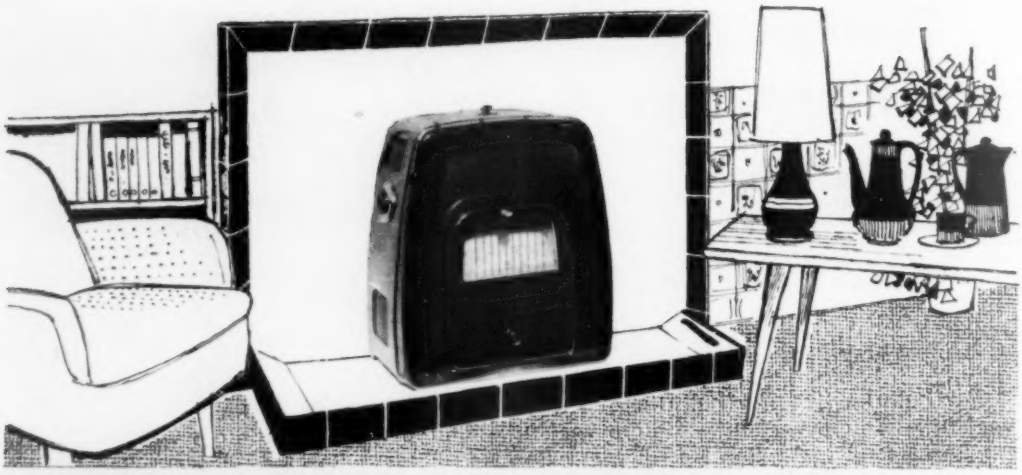
C

CRAFTSMANSHIP & GRACEFUL LIVING



The EMIE COURTIER STOVES, manufactured by Messrs. SMITH & WELLSTOOD Ltd., in their modern foundry at Bonnybridge, Scotland, are fine examples of the founders' skill, combining beauty of line with exceptional performance.

In producing quality products such as these it is of paramount importance that the castings be free from scabs, rat tails, burning-on and other defects inherent when casting grey iron in green sand moulds. That is why this modern foundry uses, in their unit system sand,

CASTEX

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Manufactured by
Messrs. RICHARDSONS MOSS LITTER Co. Ltd. of Carlisle
and Marketed exclusively by
HARBOROUGH CONSTRUCTION CO. LTD.
Market Harborough, Leics.

NOT EVEN THE BEST PEOPLE DROP OUR BRICKS— THEY SPECIFY THEM

wherever immaculate shape and size are required,
where high temperatures and heavy loads prevail
and where resistance to spalling is important.
ATLAS bricks give maximum service under these conditions.
Please ask about our new range of Super Mouldables and Castables

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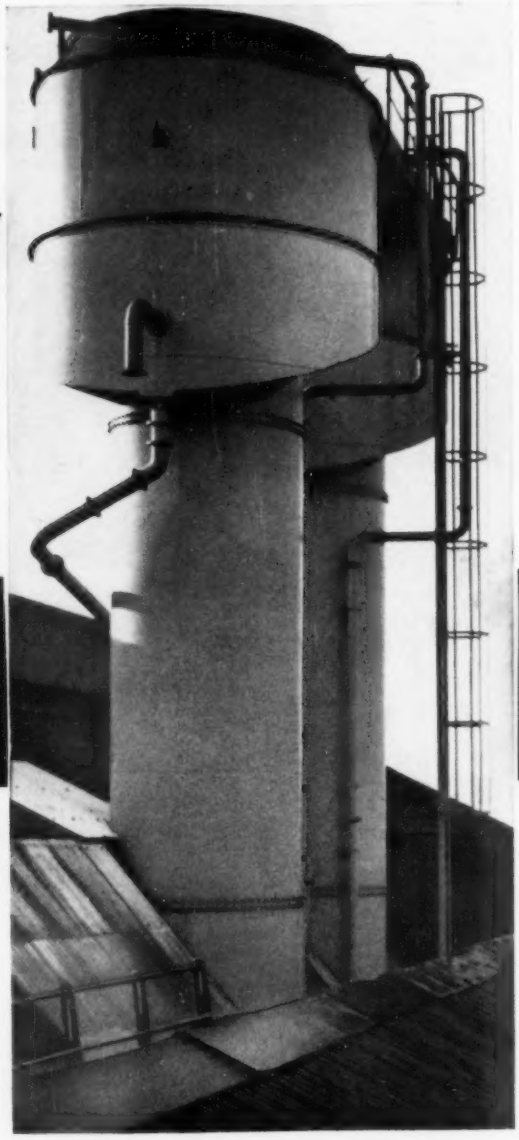
Telephone ARMADALE 313-316 Telegrams: "Combined" Armadale
A MEMBER OF THE WOODALL-DUCKHAM GROUP OF COMPANIES

ROPER

Wet type

SPARK ARRESTERS



Designed and tailor-made to suit your particular requirements. A simple yet scientific approach to the vital problem of dust and grit suppression. Illustrated is a Wet Type Spark Arrester serving a 25 ton an hour Cupola plant recently installed at R.T.B. Landore.

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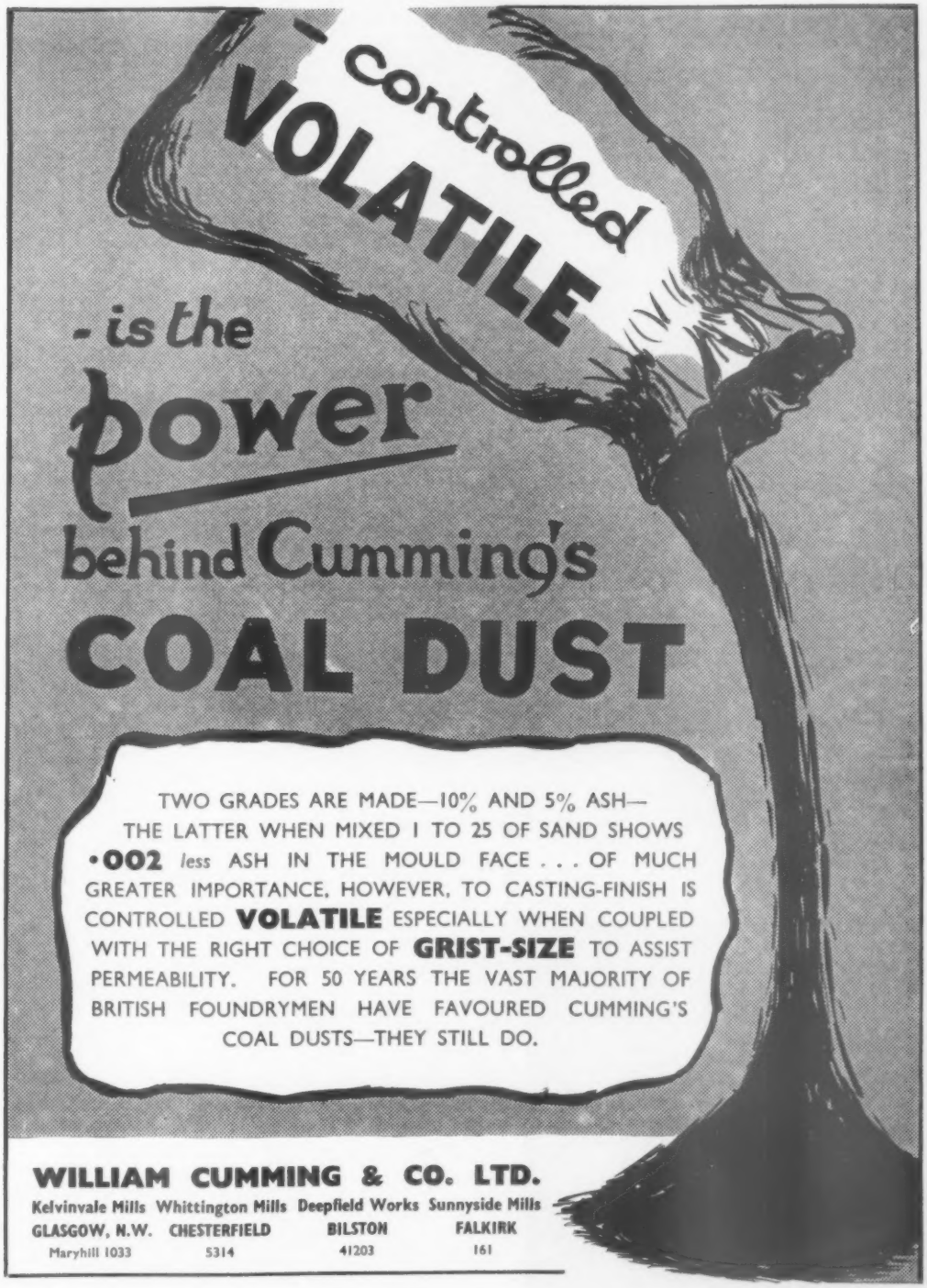
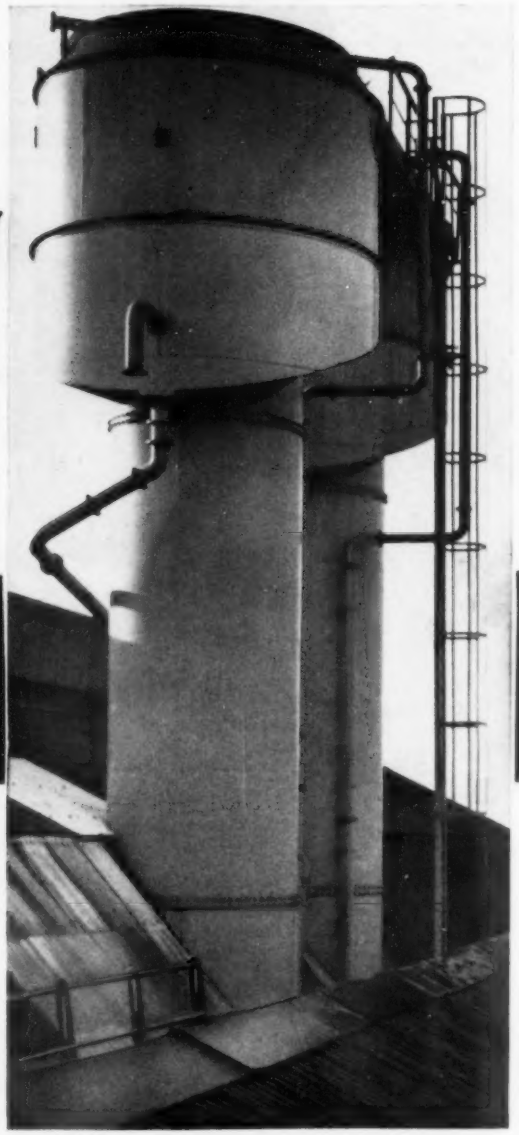
E. A. ROPER & CO LTD
FOUNDRY EQUIPMENT ENGINEERS
KEIGHLEY YORKSHIRE


- controlled
VOLATILE
- is the
power
behind Cumming's
COAL DUST
TWO GRADES ARE MADE—10% AND 5% ASH—
THE LATTER WHEN MIXED 1 TO 25 OF SAND SHOWS
•002 less ASH IN THE MOULD FACE . . . OF MUCH
GREATER IMPORTANCE, HOWEVER, TO CASTING-FINISH IS
CONTROLLED VOLATILE ESPECIALLY WHEN COUPLED
WITH THE RIGHT CHOICE OF GRIST-SIZE TO ASSIST
PERMEABILITY. FOR 50 YEARS THE VAST MAJORITY OF
BRITISH FOUNDRYMEN HAVE FAVOURED CUMMING'S
COAL DUSTS—THEY STILL DO.
WILLIAM CUMMING & CO. LTD.
Kelvinvale Mills Whittington Mills Deepfield Works Sunnyside Mills
GLASGOW, N.W. CHESTERFIELD BILSTON FALKIRK
Maryhill 1033 5314 41203 161

ROPER

Wet type

SPARK ARRESTERS



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Telephone: *Keighley 4215/6*
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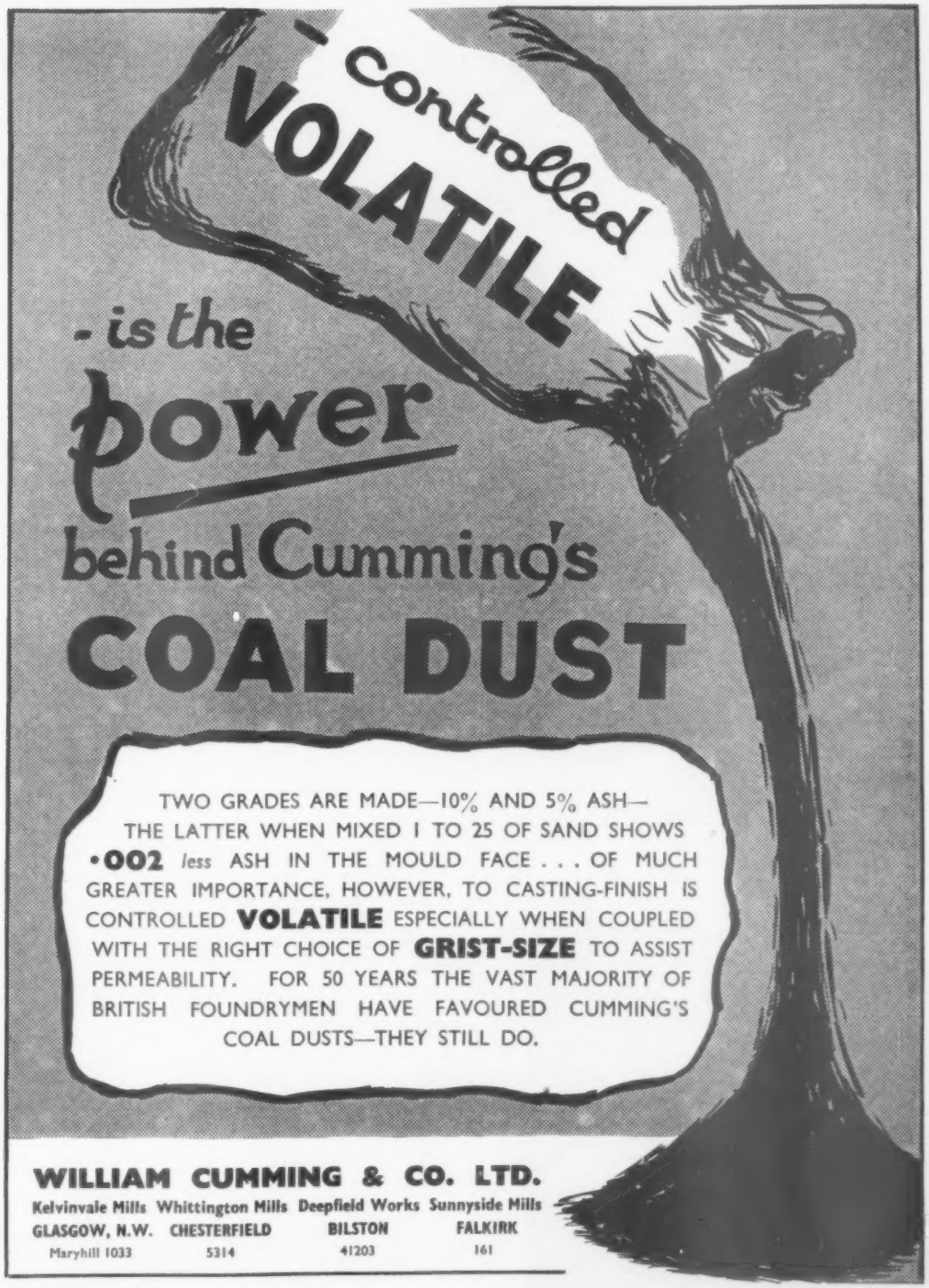
E. A. ROPER & CO LTD
FOUNDRY EQUIPMENT ENGINEERS
KEIGHLEY YORKSHIRE



TWO GRADES ARE MADE—10% AND 5% ASH—THE LATTER WHEN MIXED 1 TO 25 OF SAND SHOWS **•002** *less* ASH IN THE MOULD FACE . . . OF MUCH GREATER IMPORTANCE, HOWEVER, TO CASTING-FINISH IS CONTROLLED **VOLATILE** ESPECIALLY WHEN COUPLED WITH THE RIGHT CHOICE OF **GRIST-SIZE** TO ASSIST PERMEABILITY. FOR 50 YEARS THE VAST MAJORITY OF BRITISH FOUNDRYMEN HAVE FAVOURED CUMMING'S COAL DUSTS—THEY STILL DO.

WILLIAM CUMMING & CO. LTD.

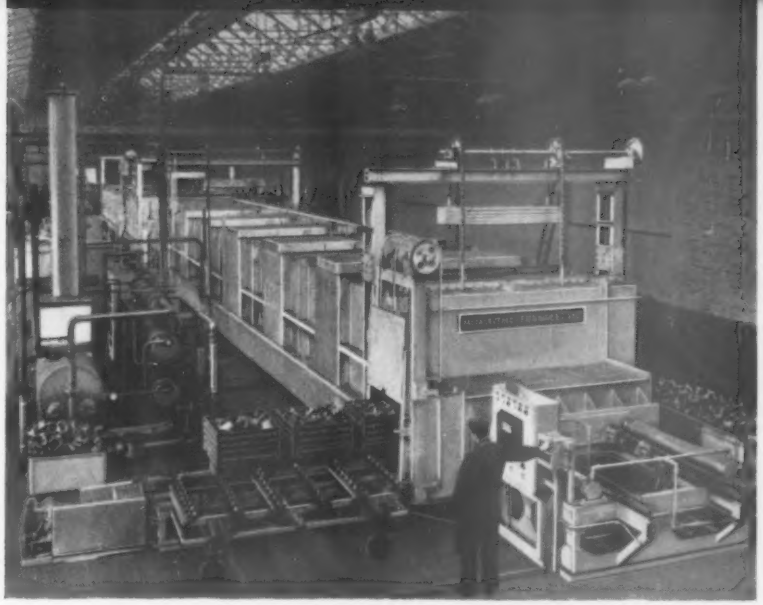
Kelvinvale Mills	Whittington Mills	Deepfield Works	Sunnyside Mills
GLASGOW, N.W.	CHESTERFIELD	BILSTON	FALKIRK
Maryhill 1033	5314	41203	161

METALECTRIC

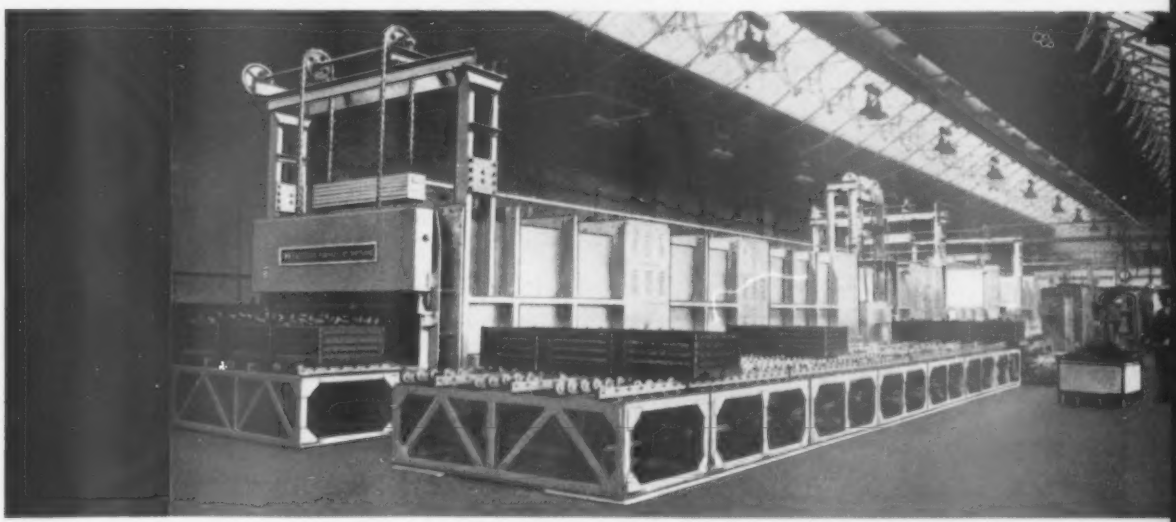
METALECTRIC designed, built and installed the foundry and annealing plant for the new GKN fully-mechanised foundry at Cwmbran, now producing MONOMAL Blackheart Malleable Castings. The illustration above shows the pouring side of the 6 ton capacity Metalectric Direct-Arc Alloying and Superheating Furnace.

Left: The instrument panel and hydraulic control desk for the Direct-Arc Furnace.

Right: The charging end of the high temperature furnace and the protective atmosphere generator.



The METALECTRIC continuous annealing plant installed in the new malleable foundry of GKN (Cwmbran) Ltd. has an output capacity of 100 tons per week. The plant produces both blackheart ferritic and pearlitic qualities, with uniform structures and minimum distortion. Only one operator is needed to look after the plant.



Above: Shows the discharge end of the second stage annealing furnace and the side discharge position for pearlitic castings.

METALECTRIC

METALECTRIC FURNACES LTD · SMETHWICK · ENGLAND

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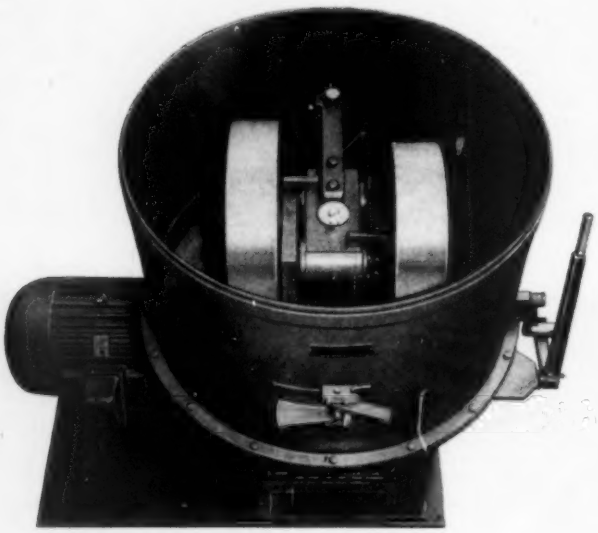
FOUMEC

42" dia Batch Type PLANTS

Sand Mill.



This Foumec 42in. Sand Mill is exceedingly versatile and ideal for varied and small requirements.

As a facing Sand Mill, for sands of an average bond strength, its capacity is approximately 3 cwts. per batch. Due to its high efficiency, and at a rate of 12/15 batches per hour, its output for facing sand can be approximately 2 tons per hour.

As a mixer for core sand with a low green bond strength the batch can be raised to 4 cwts. At 12/15 batches per hour this will give approximately 3 tons per hour.

Further details are yours for the asking, why not contact us today.

Interesting features.

★ Mullers mounted on ball bearings. They are connected to the centre pivot by a lever arm which allows them to rise or fall to suit the depth of sand in the pan.

★ Sand Mill, vertical gear and motor assembly, all on one base plate.

★ Device provided for taking sand sample without danger whilst in operation.

★ Stops are provided to prevent the mullers bearing on the pan when the latter is empty.

★ Single or double evacuation door, hand or pneumatically operated.

★ All internal parts efficiently protected against sand infiltration.

★ Centre pivot mounted on upper and lower taper roller bearings.

★ Provision of a replaceable pan bottom wearing plate and also ring.

★ Top orientable cover with hinged portion for loading materials.

FOR ALL FOUNDRY MECHANISATION PROBLEMS CONSULT:-

FOUNDRY MECHANISATIONS (BAILLOT) LTD.

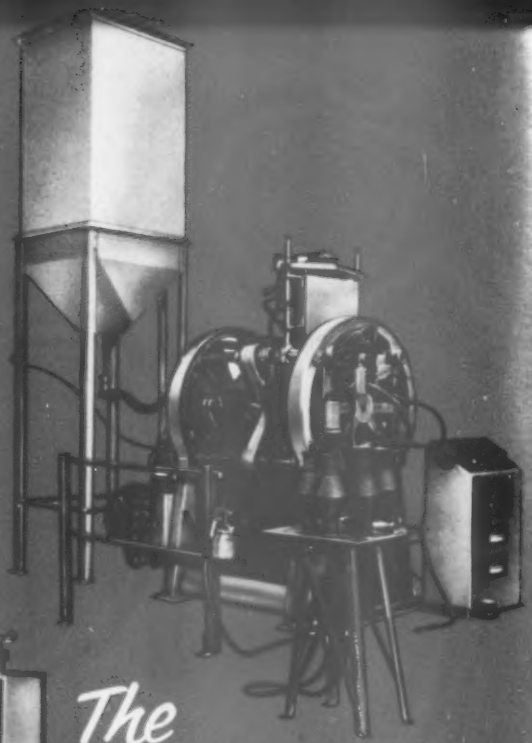
Main Offices & Works: DENBIGH ROAD, BLETCHLEY, BUCKS.

Tel.: BLETCHLEY 3354 *Regd. Office:* 29, CROMWELL ROAD, LONDON, S.W.7. *Grams:* "FOUMEC" BLETCHLEY

AN AUTOMATIC CHOICE ..

for

- BETTER CORES IN LESS TIME
- LOWER COST PER CORE
- SIMPLE OPERATION
- CLEANER CASTINGS



The SHALCO U180 fully automatic SHELL CORE BLOWER

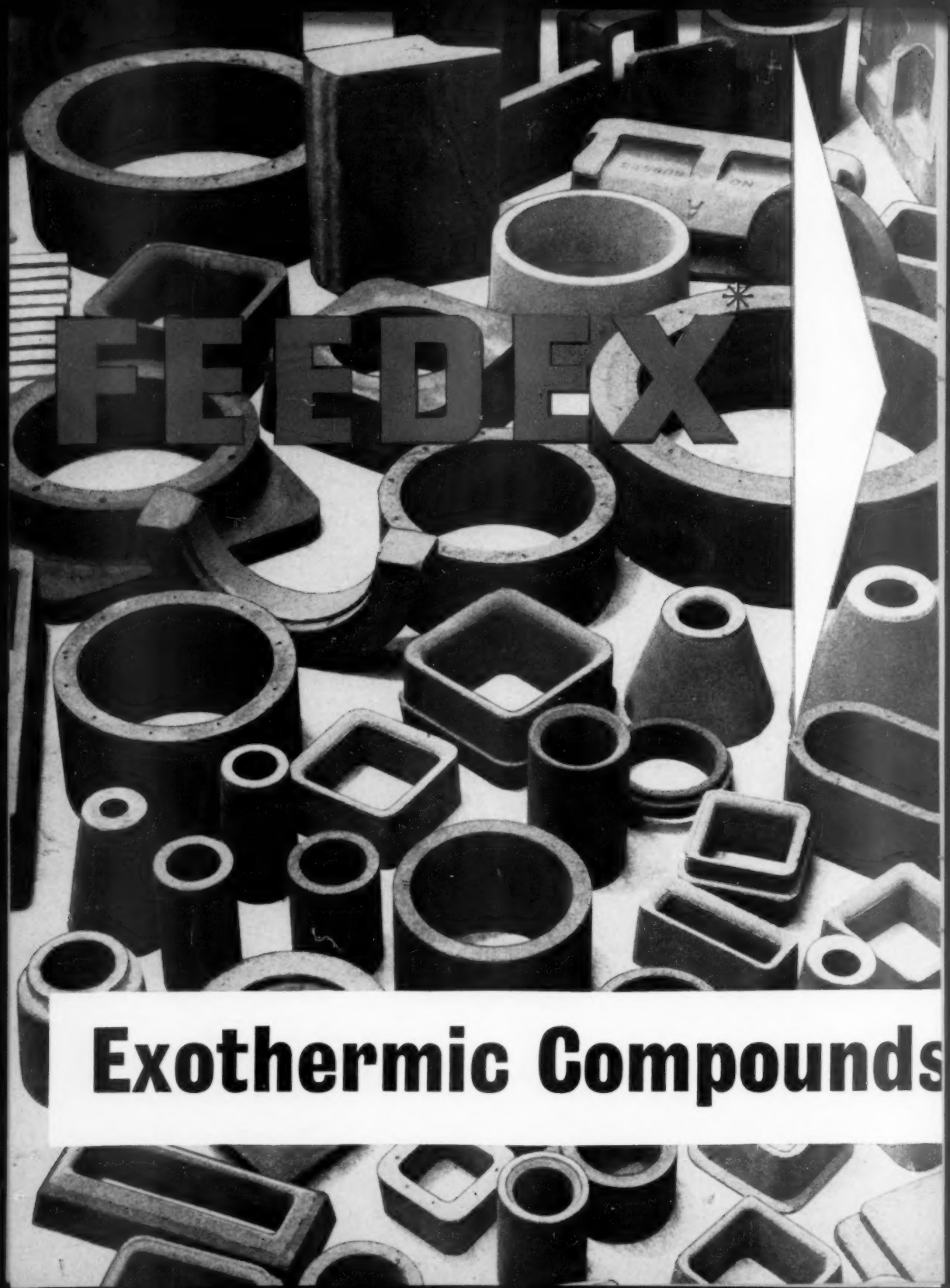
Investing, blowing, rocking and curing cycles are controlled by adjustable timers, the operator merely presses a button and the U180 does the rest. Separate driers and ovens are eliminated.

The photographs appear by courtesy of GLOUCESTER FOUNDRY LIMITED

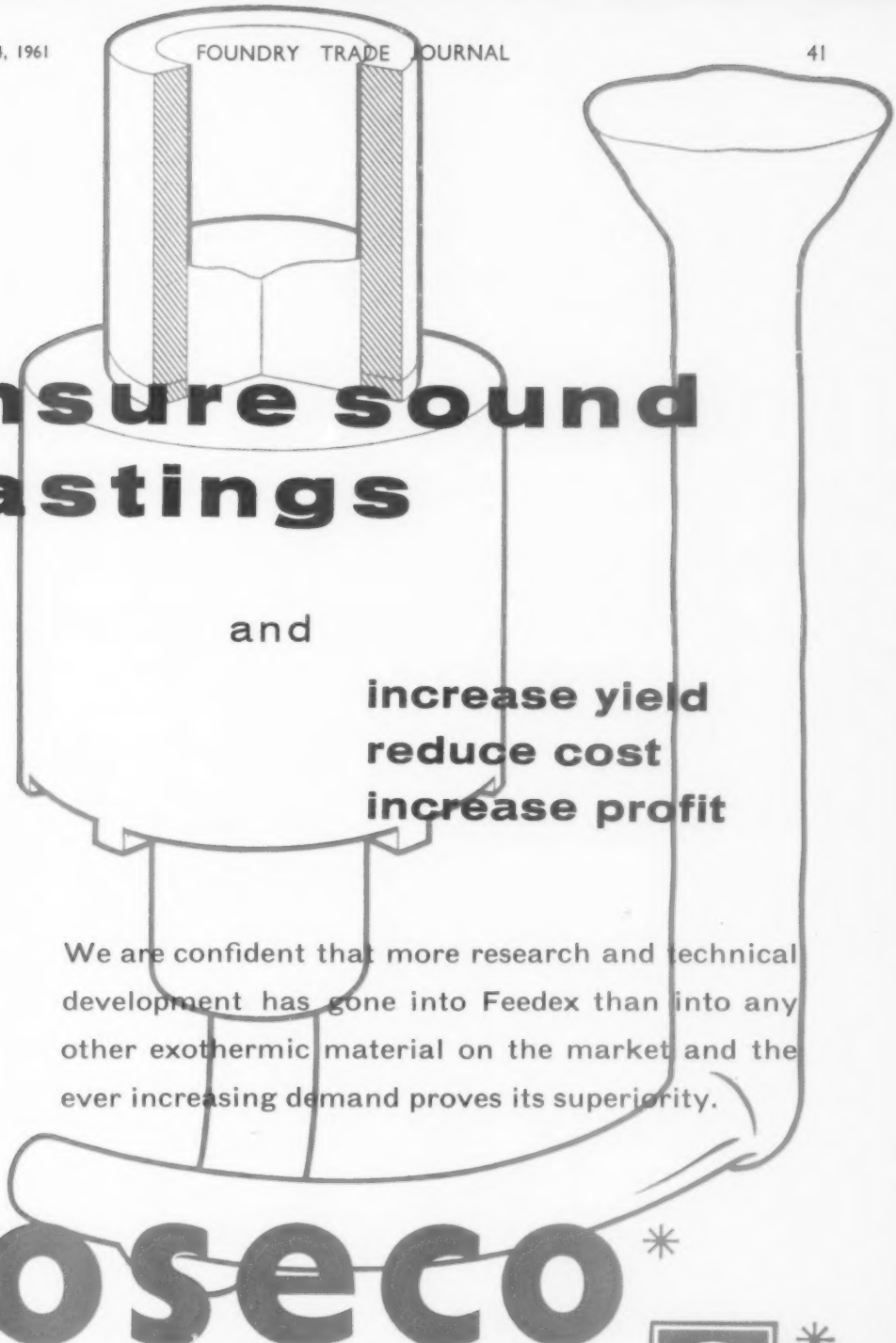
THE COLEMAN-WALLWORK FOUNDRY EQUIPMENT DIVISION OF STONE-WALLWORK LIMITED

32 VICTORIA STREET, LONDON, S.W.1 Tel: ABBey 7681

STONE PLATT GROUP



Exothermic Compounds



ensure sound castings

and

increase yield
reduce cost
increase profit

We are confident that more research and technical development has gone into Feedex than into any other exothermic material on the market and the ever increasing demand proves its superiority.

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Telephone: Tamworth 4141. Telegrams: Foseco, Tamworth

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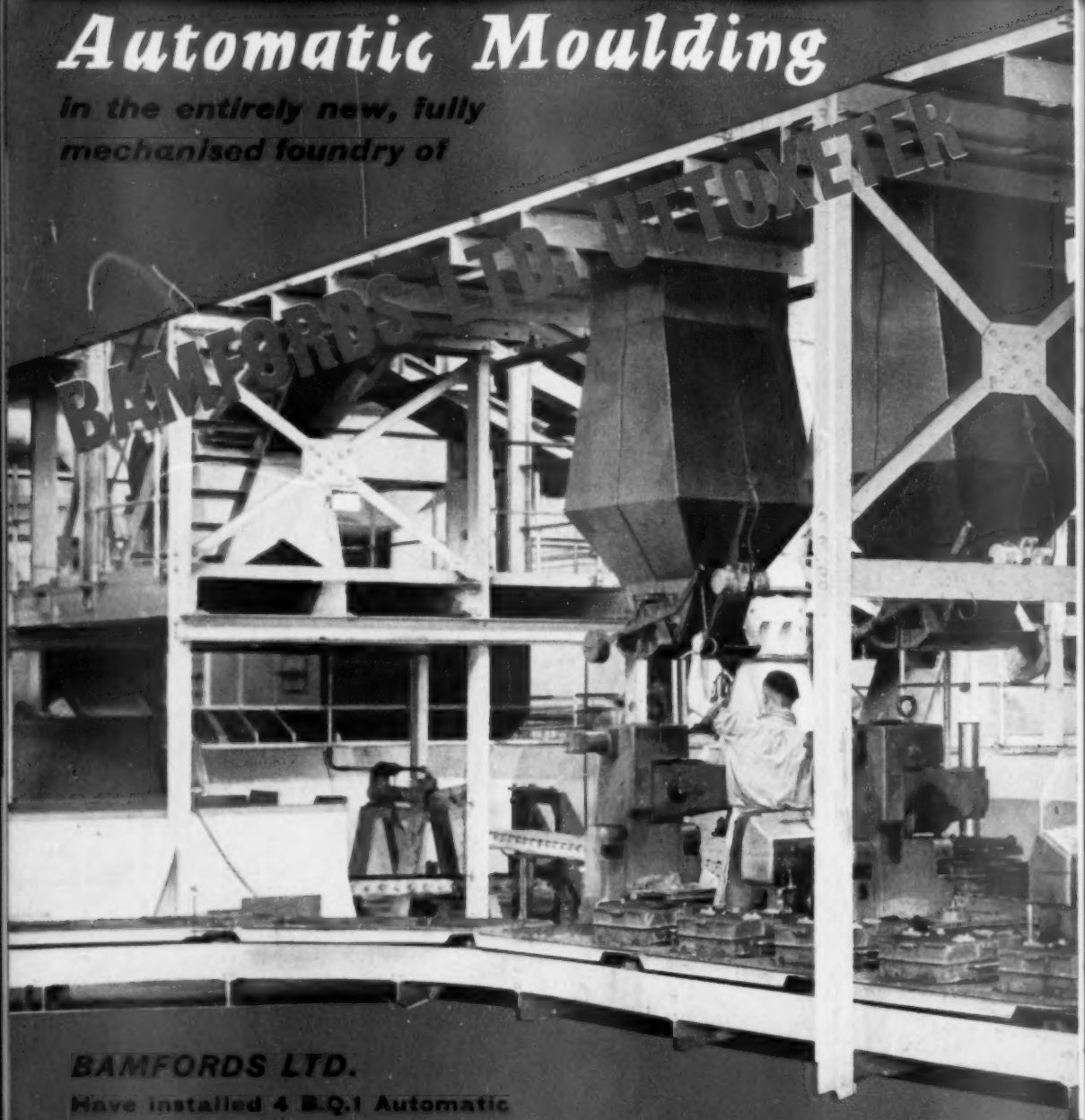
Automatic Moulding

in the entirely new, fully mechanised foundry of



BAMFORDS LTD.

Have installed 4 B.Q.1 Automatic Moulding Machines in this section of their up to the minute foundry. B.Q.3 Automatic and B.T. Turnovers are producing larger moulds in another completely mechanised section.

WRITE NOW FOR DETAILS OF **B.Q. AUTOMATIC MACHINES**

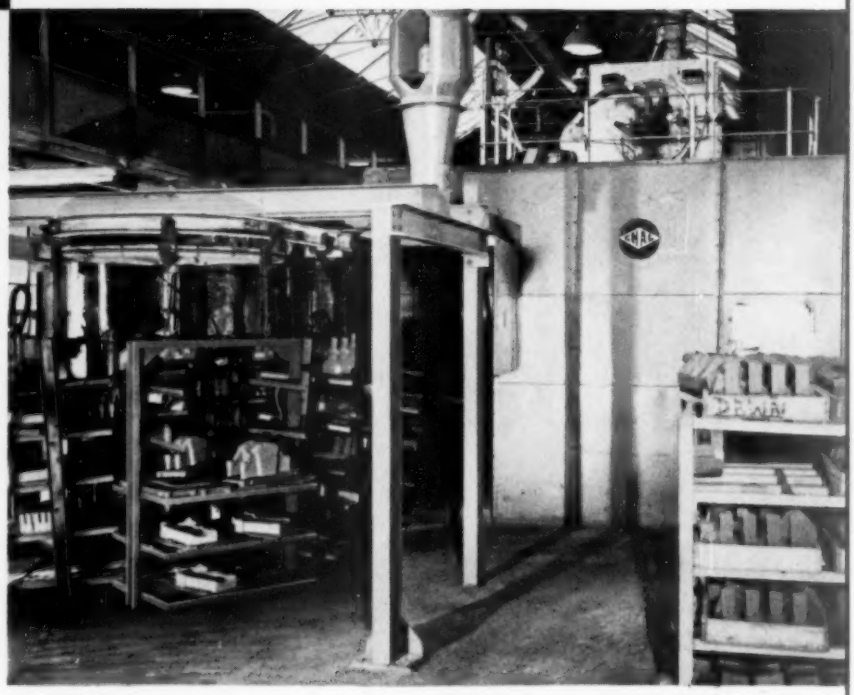
BRITISH MOULDING MACHINE CO. LTD.

Telephone: FAVERSHAM 2246/7/8

WESTON WORKS - FAVERSHAM - KENT

Telegrams: EASIRAM, FAVERSHAM

Core and Mould Drying Ovens



Controlled Heat and Air Ltd., designed, built and installed the Direct Oil Fired Air Circulated Core and Mould Drying Oven for the new foundry of GKN (Cwmbran) Ltd. This new foundry has been designed to produced Blackheart Malleable Iron Castings in MONOMAL The C.H.A.L. drying oven can handle approximately 300 moulds per hour and operates at temperatures up to 550°F.

CONTROLLED HEAT & AIR LTD.

SMETHWICK · ENGLAND

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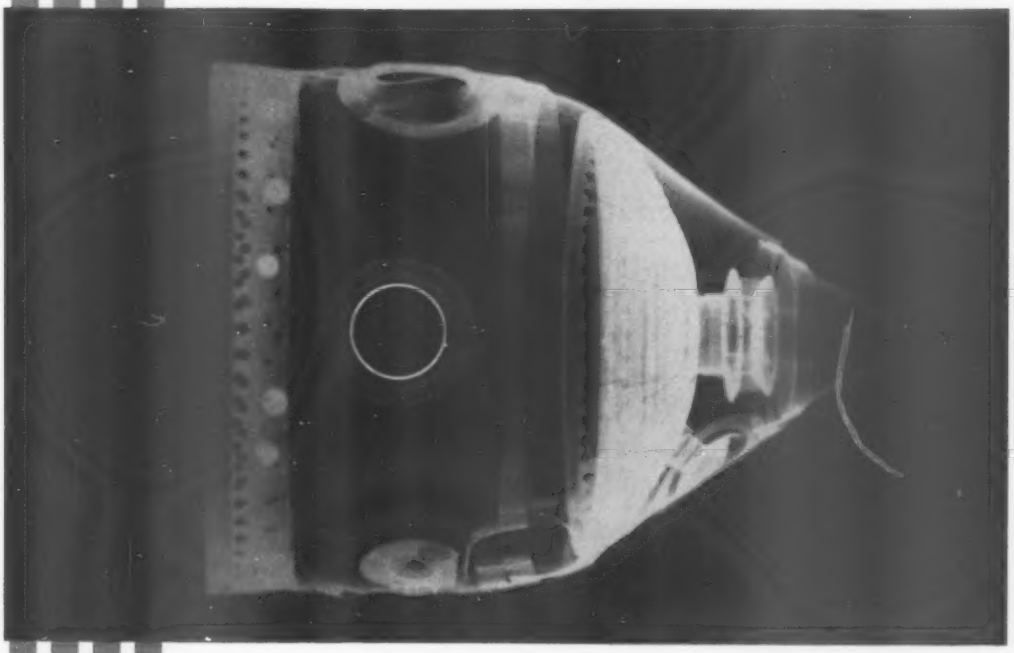
For radiographing assemblies, castings and welded seams



ILFORD Industrial "B" X-ray film is a general purpose film suitable for the non-destructive examination of encased assemblies, as well as for light alloy castings, steel castings and seams in pressure vessels. Its characteristics are high speed with fine grain, providing excellent definition with high contrast. ILFORD Industrial "B" film gives the best results when it is developed in ILFORD Phenisol high-energy concentrated liquid developer. It is suited to radiography with X-rays or gamma rays.

ILFORD INDUSTRIAL "B" X-RAY FILM

ILFORD LIMITED · ILFORD · ESSEX

Sterling

SHAKEOUT MACHINES

Sterling Shakeouts have been on the market for over 20 years and have been constantly improved during that period as a result of running experience in every type of foundry both at home and overseas.
They are made in capacities ranging from 2 cwts. per machine to 25 tons per machine.
Multiple units can be supplied to take loads up to 150 tons.
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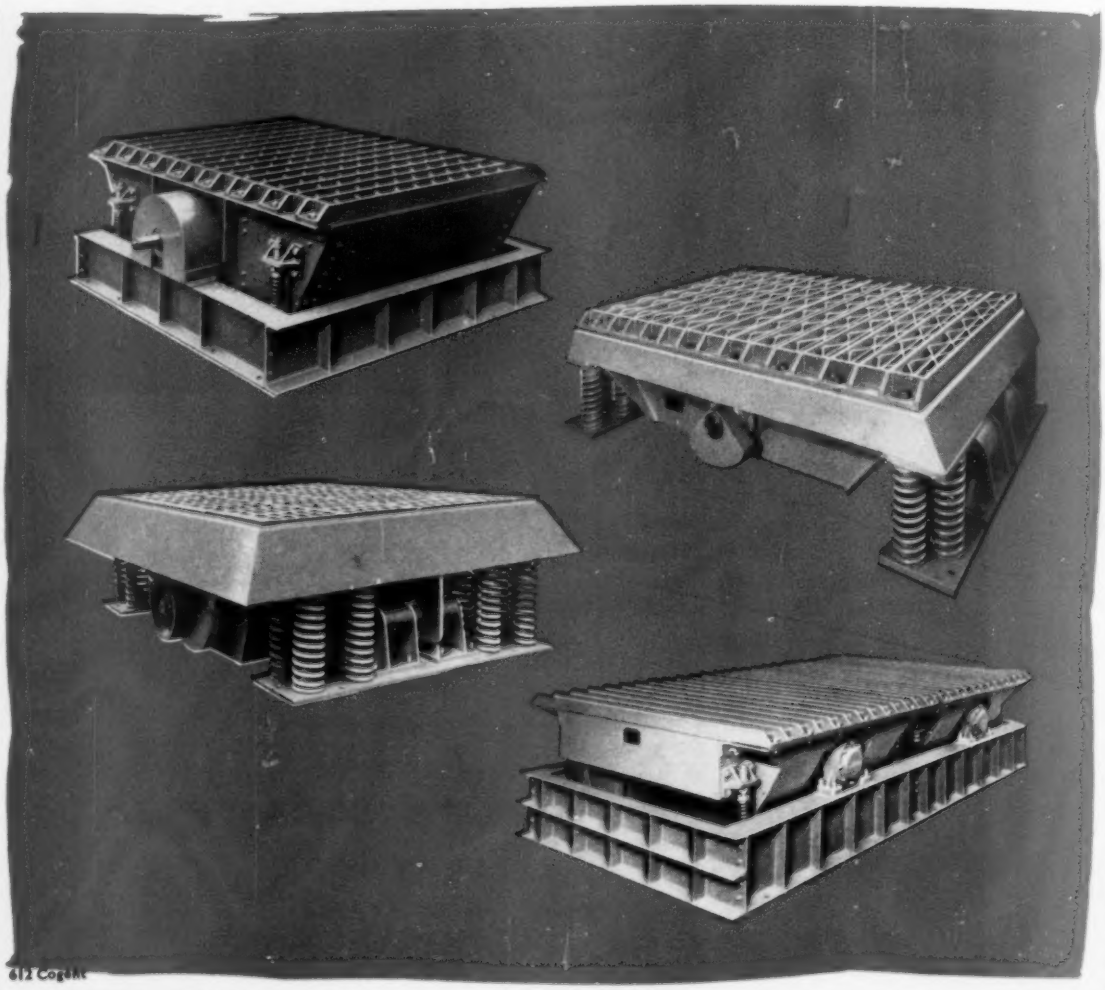

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FOUNDRY
TRADE JOURNAL

Vol. 111 December 14, 1961 No. 2349

Britain and the Common Market—the French Point of View

L'Usine, the great organ of the French iron and steel industries, has made an abstract of a statement emanating from the Minister for Industry on the subject of Britain's possible entry into the European Common Market, which is of considerable interest to the British foundry industry. He insists there is little for French manufacturers to fear, but does equally stress that it would be unwise to underestimate British potential competition. On the former grounds, he points out several factors which may favour the French position, placing high on the list of British changes which will have to be made an adjustment of the differential between male and female labour rates. In France, the difference is 17 per cent., whilst here—he states—it is 35 per cent. Next, he says, there would have to be no unilateral devaluation of sterling; a radical change would have to be made in the amount of payment made by the Government for employees' social services (which at present, he believes, tends to lower British selling prices); then, he contends, something would have to be done about private arrangements which put a brake on the entry of foreign goods into Great Britain. The British Government subsidies to agriculture would have to go, for at the moment in France, the high prices of foodstuffs act adversely against an industrial undertaking's competitive position, he believes.

There is a tendency in France to underrate this country's competition potential and the French Minister reminds his public that British industrial output is the highest in Europe; it is nearly a third of the total, as against 24 per cent. for Germany, 16 per cent. for France and 9.5 per cent. for Italy. At the moment, however, British output has lost first place in four industries:—steel, radio materials, foodstuffs and automobiles, in all of which Germany now leads, the Minister states. The United Kingdom, however, uses the most electrical energy per head of population. Fear is expressed in the French document referred to that Britain's entry into the Common Market may provide a jumping-off board for American industry. The Minister pointed to the fact that USA investment in British industry totalled $2,500 millions as against but $650 millions in France. Thus, he said, the Americans controlled more than 40 per cent. of British motorcar output and with the backing of American capital, the Common Market would be wide open to such firms operating from the UK. Finally, the Minister dealt with a few individual industries. He called attention to the fact that capital goods, such as machine-tools, electric and electronic plant, represent a quarter of British exports, whilst for general-engineering goods, the British production potential was 2½ times greater than the French. This was also true of electrical plant, he added.

The main points for which the French are striving are free access of the "six" to Commonwealth markets; the unification of the fiscal and social systems of UK with those of the existing Common Market countries and the equalized placing (*placement équilibré*) of American investments and licences between Great Britain and the continental countries. We presume by this that exclusive trading and manufacturing licences would have to be discontinued, but so far as investments are concerned, surely that is a matter for the individual or his firm?

Institute of Metals' Spring Meeting

The 1962 Spring Meeting of the Institute of Metals will be held at Church House, Great Smith Street, London, S.W.1, from March 20 to 22, and the main features of the programme are given in what follow.

Tuesday, March 20: The annual general meeting will be held at 10.30 a.m., followed by the presidential address, given by the Earl of Verulam. In the afternoon, two simultaneous technical sessions will be held, session A being devoted to a symposium on "Uranium and Graphite," arranged by the Nuclear Energy Committee, and session B taken up with a discussion on "Structural Aspects of High Strain-rate Deformation," arranged by the Metal Physics Committee. At 6 p.m. the May lecture will be delivered.

Wednesday, March 21: Simultaneous technical sessions will be resumed at 10 a.m., session A being given over to a symposium on "Uranium and Graphite" (continued from the previous day), and session B will consist of a discussion of three papers dealing with engineering metallurgy. In the afternoon, session A will continue with the symposium on "Uranium and Graphite," whilst session B will discuss three papers dealing with properties of materials. In the evening, a Conversazione will be held at 17, Belgrave Square, London.

Thursday, March 22: Thursday's programme will be taken up by a symposium on "Electron-probe Microanalysis," arranged by the Metal Physics Committee, and in the evening, the Institute's dinner/dance will be held at Grosvenor House, Park Lane, London.

Dinners

BRITISH STEEL FOUNDERS' ASSOCIATION

The biennial dinner of the British Steel Founders' Association was held on Thursday last at Claridge's, London, some 220 members and guests attending. The chair at the dinner was taken by Mr. C. H. Kain (chairman of the Association) and with him on the top table were the Rt. Hon. Viscount Hailsham, Q.C. (Lord President of Council and Minister for Science); Mr. M. A. Fiennes (Davy-Ashmore, Limited); Mr. W. D. Pugh (English Steel Castings Corporation, Limited); Mr. M. C. Lloyd, M.B.E. (vice-chairman, BSFA); Sir Ronald Morison, Q.C. (British Iron & Steel Federation); Sir Cyril Musgrave, K.C.B. (chairman, Iron & Steel Board); Sir Harry Melville, K.C.B., F.R.S. (Department of Scientific and Industrial Research); Mr. T. H. Summerson, D.L., J.P. (past-chairman, BSFA); Mr. W. S .Scott (chairman, British Steel Castings Research Association); Sir Robert Shone, C.B.E. (Iron & Steel Board); Mr. T. W. McCullough, O.B.E. (Chief Inspector of Factories); Dr. J. S. Carter, C.B.E. (Chief Alkali Inspector, Ministry of Housing and Local Government); Sir Charles Goodeve, O.B.E., F.R.S. (president, Iron & Steel Institute); Mr. J. H. Osborn, M.P., and Mr. G. M. Menzies (past-chairman, BSFA).

After the Loyal Toast, the Rt. Hon. Viscount Hailsham proposed that of "The Steelfounding Industry and the British Steel Founders' Association." Using as his theme that the present age had shown there was room for co-operation in a free-enterprise society, he said that this was applicable to, and epitomized by, the British steelfoundry industry, but stressed that it was necessary for the industry to remain technologically in the van of progress. He said that no unit in industry was so small that it could not afford to subscribe to its research association and moreover could not afford the technical journals which record advances in the industry. Mr. Kain thanked the Minister for his excellent address and mentioned the steelfounders' debt to the Department of Scientific and Industrial Research. He then proposed the toast of "Our Guests," mentioning prominent guests by name and welcoming the whole of the assembly. Mr. M. A. Fiennes (president-elect, Iron & Steel Institute) responded, and said that as an engineer, he was pleased to record that there had been a tremendous improvement in the quality of steel castings in recent years.

WORSHIPFUL COMPANY OF FOUNDERS

The Livery dinner of the Worshipful Company of Founders was held by courtesy of the Rt. Hon. the Lord Mayor of London, at the Mansion House, last Friday. It was presided over by the Master, Mr. E. W. Moss, M.I.MECH.E., M.I.E.E. At the *table d'honneur* were the Rt. Hon. the Lord Mayor, Alderman Sir Frederick Hoare; Sir Kenneth Haigh (president of the Institution of Mechanical Engineers); Mr. D. B. Irving, B.SC. (chairman, London Electricity Board); Sir Hamish Maclaren, K.B.E., C.B.; Mr. Kenneth Marshall, M.A. (director, Joint Iron Council); Mr. J. F. V. Woodman; Mr. S. W. Lawrence; Mr. A. Stanley Young ("father" of the Founders Company); Mr. Douglas S. Young, C.C. (immediate past-Master); Colonel and Alderman R. H. Studholme, O.B.E.; Mr. W. Stovin-Bradford; Sir Charles Westlake, M.I.E.E.; Dr. A. C. Elkin, M.D.; Mr. D. A. Richards (president, Institute of British Foundrymen); Dr. Gordon Sears, M.D.; Mr. S. F. Steward, C.B.E.; Mr. R. O. Sherrard (Master of the Girdlers Company); Mr. A. M. Holbein, C.B.E. (president, City and Guilds of London Institute); Mr. A. W. Hawes; Lt.-Col. Geoffrey Carr, M.C.; Alderman C. James Harman (Master of the Clock Makers Company); Mr. W. G. Fossick, M.A. (past-Master); Mr. John C. Taverner; Mr. N. G. Fossick; Mr. J. A. Taylor (past-Master); Alderman Sir Frederick Wells, Bart.; Dr. S. R. Costley; Mr. J. R. Beard, C.B.E., M.C. (Master of the Makers of Playing Cards Company); Mr. D. C. Hailey; Mr. Sheriff C. Rawson; Mr. Harvey B. Young, M.I.C.E., M.I.MECH.E. (Upper Warden); Dr. J. G. Pearce, C.B.E., M.SC., M.I.MECH.E., M.I.E.E. (under warden), and Alderman and Sheriff J. L. P. Denny, M.C.

The toasts were proposed by the Master, Mr. M. M. Hallett, M.SC., F.I.M., and Mr. D. B. Irving, the responders being the Lord Mayor, His Honour Sir Brett Cloutman, V.C., Q.C., and the Master of the Company. During the evening music was provided by the Aylmer Orchestra, under the direction of Harold Williams.

Luncheon

GEORGE COHEN 600 GROUP

George Cohen 600 Group, Limited, held a Christmas luncheon at the Black Angus Grill, London, last week, to which members of the trade and technical Press were invited. The purpose of the luncheon was to say "thank you" to members of the Press for the help received during the year, and at the conclusion of the meal, Mr. Percy R. Levy (director of the 600 Group) voiced his thanks and stressed the informality of the occasion. Thanks on behalf of the guests were then rendered by Mr. W. E. J. Beeching (of *Machinery Market*).

The Minister of Pensions and National Insurance, Mr. John Boyd-Carpenter, has reappointed SIR IFOR EVANS, Provost of University College, London, to be chairman of the National Insurance Advisory Committee for a further period of five years from January 1, 1962.

Malleable Production at Cwmbran

GKN Group extend their Foundry Facilities in Monmouthshire

Considerable planning and market research are necessary nowadays before a major project like the building of a new foundry is undertaken. Even if satisfactory figures are returned for potential sales it still remains to envisage how plant and equipment may be chosen to exploit optimum capabilities of production both in terms of material quality and labour utilization. Furthermore, long-term forecasting of supply and demand and assessment of past and future trends all indicate the necessity for a degree of flexibility which may oppose the institution of full automation. Against this background, the following account of the new GKN malleable foundry has been prepared. Sufficient of the history of the Group has been quoted for an assessment of its present status and thereafter the story is expanded into detail of the plant and processes operated—all with the objective of showing how choice has been affected by the precepts enunciated earlier.

Before recording details of the GKN Group's most-recent venture in Monmouthshire—the erection of a 100-tons-per-week malleable foundry at Cwmbran—it is germane to describe the background of this organization, so as to place the newest extension of activities in the appropriate setting. As its name implies, Guest, Keen & Nettlefolds (Cwmbran), Limited, is a member of the GKN Group of companies, which originated with the amalgamation in 1902 of Guest, Keen & Company, Limited (incorporating Guest & Company, the Patent Nut & Bolt Company, Limited—which then owned Cwmbran Works—and the Dowlais Iron Company). Since that time, the Group has expanded considerably and the products and services which it offers to industry are both widespread and varied. Whilst the "man in the street" probably associates the initials GKN with nuts, bolts and screws, these, in fact, constitute but one of the numerous activities with which the companies in the Group are concerned. Other units produce a complete range of steel bars, sections, sheet and strip, but most are concerned with the production of fabricated components and finished goods, ranging from safety-pins, through office-furniture and farming equipment, to railway bridges and complete steel buildings. In fact, the GKN Group pride themselves on making something for every industry and every trade, and in catering for engineering in all its aspects—shipbuilding, aircraft, road and rail transport, chemical, petroleum and agriculture.

HISTORICAL

Cwmbran Works was built as an iron foundry in 1800, but from time to time extensions were made to the activities of the firm as industrialization progressed. Such developments included acquisition and building of collieries, coke ovens, blast-furnaces, puddling furnaces, rolling mills, bolt-and-nut sections, a fabrication department and refractories works. With the passing of the years, the appearance of the works has been completely changed; many of its sections no longer operate and existing departments have been brought up to date to conform with modern practice. The ownership of the works, too, has changed hands at different times before it came into the GKN Group in 1902. Thus, GKN (Cwmbran), Limited, is now concerned only with iron foundries and fireclay refractories, the other departments of the Cwmbran Works having been transferred to other companies in the Group directly concerned with the respective products.

To-day, in the Cwmbran Foundry Division, where about 1,500 operators are employed, there are no fewer than seven sections, several of which have been largely rebuilt and mechanized in the post-war years. These are: (1) A large general foundry carrying out short-run jobbing type of castings production; (2) a patternshop serving the whole Group; (3) a cylinder-head, (4) -block, and (5) camshaft founding sections; (6) a railway castings section, and (7) the newest extension—producing malleable-iron castings. Total castings production amounts to some 100,000 tons per annum. Construction of the large modern motor-castings foundry began in 1951, and since that time, the company has built also the pattern-making shop and administrative building, a modern canteen and amenity block, together with a well-equipped medical block under the charge of the works' doctor. The extension for malleable was completed only in the autumn of this year.

General Lines of Production

The company's general foundry section produces cast-iron chairs and baseplates (the latter castings nowadays largely replacing chairs on new stretches of railway line); various castings such as brake-blocks and oil axle-boxes for railway wagons; bracket castings for carrying cables on electrified railways; the GKN Patent Honeycomb floorplate—widely used in the making of concrete and similar floors likely to be subjected to heavy wear—and also many other general-engineering castings. The

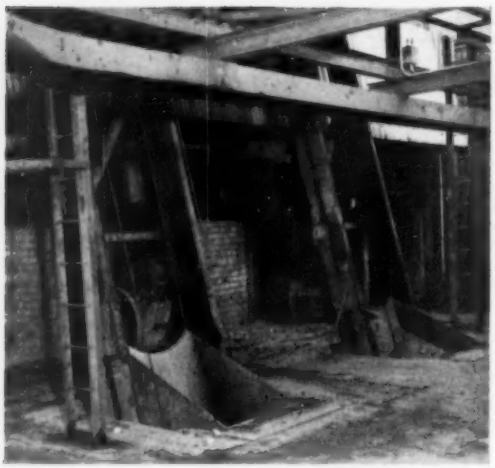


FIG. 1.—*Floor-level hoppers of the two inclined skip-hoist cupola chargers at the Cwmbran malleable foundry; 10-cwt. charges are accommodated.*

motor-castings foundry produces cylinder-blocks, -heads and camshafts, engine sumps and flywheels for petrol and diesel engines, and also brake-drums and gearboxes for motor vehicles.

The Refractories Division comprises a brick-works, which is sited about a mile and a half from the foundries. Raw material for this works is obtained mainly from the company's Blaendare fireclay mine (situated about five miles away).

MALLEABLE FOUNDRY

The new Cwmbran foundry for the production of malleable iron, which has recently been completed, has now passed through the proving stage, current production being about 100 tons per week. A most important objective throughout its building and equipping has been complete process mechanization as far as is feasible in the present state of knowledge and using this new concept as a means of securing a high load-to-labour ratio and hence high productivity per man/hour, whilst still retaining a fair flexibility of output. For example, using the most modern furnace and practice available, the whole annealing operation is carried out by two men and a controller.

What now follows is a description of this new foundry, embodying comment on the choice of site, equipment and plant installed. In the account, an attempt is made to replace a mere catalogue of plant by a living description of means applied to secure the stated objectives.

Choice of Site

In 1959, when it was desired to proceed with the laying down of a new malleable-iron foundry within the Cwmban Works, it was decided that the plant should be located on the site and in buildings previously occupied by the recently-transferred railway-fastenings division of Guest Keen's Midlands Division. These buildings, although erected some considerable time ago, have proved to be admirable for the purpose. The geographical location is also ideal for administration from the present foundry offices, and there is ample crane capacity and accommodation for secondary functions, such as works offices, patternmaking, and pattern repairing, maintenance and machine-repair shops, first-aid and canteen facilities. There is also a considerable area earmarked for future expansion.

Flow-line Production

Brief examination of the production scheme envisaged, shows that this naturally divides into five sections—melting, sand-preparation, moulding and coremaking, annealing, fettling and despatch. It was soon decided to incorporate cupola melting of raw metal, with these units feeding a direct-arc furnace. This permits of the location of melting-shop controls at the cupola* and the electric furnace, and in the execution of the plan, "very tight" specifications can be maintained, with resultant advantageous effects on casting practice. Moulding is based on a continuous sand supply system, providing good-quality unit sand for semi-automatic moulding machines. Annealing, described in more detail later, is effected in a continuous furnace of very advanced design, the castings later moving to fettling and despatch areas in a natural flow-production pattern.

Melting Plant

The melting plant installed in the new foundry consists of two cold-blast cupolas. Of Whiting design, these units are equipped with dry-type spark-arresters. They supply metal at a temperature of about 1,350 deg. C. directly by a tilting trough to the direct-arc furnace, the latter being used to bring the metal to the required specification and also for superheating. The cupola furnaces each have a shell diameter of 6 ft.; their total height above the baseplate is 62 ft.; from the baseplate to the charging door 22 ft., and from baseplate to floor level is 9 ft. They are lined down to 39 in. at the melting zone, are fitted for continuous slagging and can easily be adapted for wet granulation of slag.

The direct-arc furnace has a capacity of 7/8 tons and is of the nose-tilting type, the 8½-ft. dia. shell being made by Bayliss Jones & Bayliss, Limited. It has three automatically-adjusted vertical 7-in. dia. electrodes and a multi-voltage power transformer, the main transformer being supplied by English Electric Company, Limited. The fur-

* The major items of melting and heat-treatment equipment were contracted for and progressed to completion by Metalectric Furnaces, Limited, of Smethwick, as main contractors, in association with other members of the Incandescent Group as sub-contractors for specific items. Briefly, the split-up was as follow: Metalectric Furnaces, Limited, supplied the direct-arc holding furnace and continuous malleabilizing furnace, and Incandescent Heat Company, Limited, the cupola-melting plant and atmosphere-generation plant, whilst the core-drying oven was supplied by Controlled Heat & Air, Limited.

nace electricity supply is approximately 11,000 kv., three phase, 5 cycles, with earthed neutral. Motors and controls are on a 400/440 v. three-phase 60 cycles supply. The electrical rating of the unit is 1,000 kva., sufficient to permit the rapid melting of a good supply of back-scrap from cold at starting-up time; later the furnace is able to go over to the lighter duty of holding iron at correct temperature for pouring. Whilst holding this metal at pouring temperature, it is possible to make additions of steel scrap and/or ferro-alloys at approximately half-hourly intervals, to maintain desired compositions. From the electric furnace, the metal is poured into a ½-ton capacity drum-type bull ladle which, in turn, feeds several 200-lb. pouring pots.

Ancillary equipment for the melting plant comprises two Whiting inclined skip-hoists (Fig. 1) fitted with Dewhurst switchgear, and one tilting trough of two- to three-cwt. capacity of molten metal and of hinged "see-saw" construction. The latter is employed to interrupt the supply of molten metal from the cupola to the holding furnace, as necessary. Blast for the cupolas is provided by two fans, each of 5,000 cu. ft. per min. capacity at 35-in. w.g., and an air-pressure/volume-control unit has been fitted by GKN themselves.

Electric-arc Furnace

Turning to the direct-arc holding and superheating furnace (Fig. 2), other details of this equipment are as follow: The roof is of the fixed type and there is a hydraulically-operated side door which allows for slagging and refining operations. This is positioned opposite to the pouring spout, which latter is arranged for easy removal. The furnace can be tilted in either direction by single hydraulic cylinders coupled to the furnace shell. For this purpose, cradles are fitted to the shell and carried in roller support-frames, attached to the foundations, the one cradle also forming a "dog-box" to enable the cupola metal to be laundered direct to the furnace. Cradle tilting also allows of continuous pouring to be carried out without adjustment to the cupola launder.

The three 7-in. dia. electrodes are controlled automatically by electro-hydraulic mechanism (also of Metalectric design), whilst manual controls are also provided—by which the operation point may be adjusted to give correct conditions for the different phases of melting and refining. The various controls—hydraulic, arc and switchgear—are contained in separate cubicles of easy access, and the whole equipment is provided with a number of safety devices, along with full instrumentation.

The melting arrangements allow of analysis and physical testing of the metal to take place at regular intervals at the cupola and the electric furnace, and it is also possible to pour test-bars simultaneously with moulds—a requirement laid down in some of the British Standards worked to.

Raw-material Handling

Raw materials are placed in a carefully-designed stockyard, the structure of which was laid out by Metals & Equipment (Wolverhampton), Limited. These facilities are serviced from both rail and road the materials being bunkered by an overhead gantry crane, fitted with a conventional-type magnet. All raw materials, such as coke, black-scrap, pig-iron, and limestone, are conveniently situated adjacent to two charging skips of 10-cwt. capacity each. These are fitted with Ashworth Ross weighing scales and run on an oval-shaped monorail track. The stockyard is sectioned into small divisions to permit segregation of different deliveries of scrap.

Moulding and Pouring

As stated previously, the moulding equipment installed at Cwmbran is based on the employment of a continuous sand-reconditioning system and a high mould-production rate is obtained with a minimum of labour. Moulds are produced on BMM jolt/squeeze machines (four pairs being installed), one pair producing cope-half and the other drag-half moulds; an important point to note is that these machines can be used by unskilled labour. The maximum production is 120 moulds

FIG. 2.—*Direct-arc holding and superheating furnace of 6 tons, 1,000-kva. capacity, at the new GKN foundry. Also shown, right, is the transfer launder delivering cupola-melted metal.*

per hour per set of machines. Although the machines themselves operate on an automatic cycle —and can be pre-set to give any jolt/squeeze and stripping period within their range—they are more-accurately described as semi-automatic, in so far as the operator has to supervise the measurement and adequate spread of the moulding sand in the box. This eliminates considerable expense and complication of the equipment, but apart from these simple operations, the machine does the rest. As is usual practice, one pair of machines is kept as a standby, *e.g.*, to accommodate pattern changes or maintenance work. Compressed air is supplied from a TS2 Broom & Wade unit rated at 675 cu. ft. per min. at 100 lb. per sq. in.

Pouring and Knockout

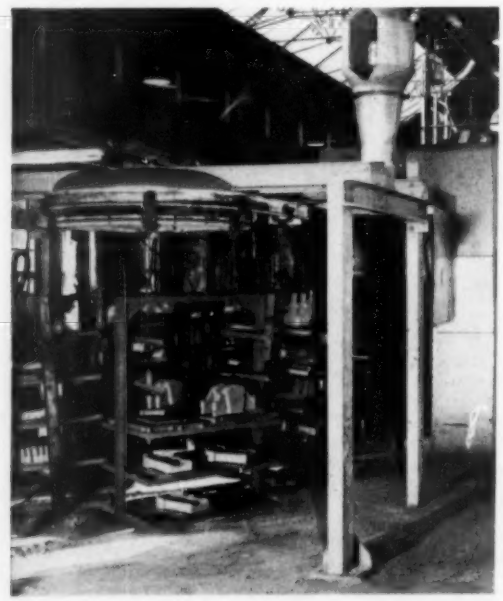
After the moulds are produced, cored and closed, they travel 35 ft. on a pallet conveyor to the pouring station, which is fitted with an extensive fume-extraction plant. The moulding boxes used are standardized in one dimension, namely length, because this is required by the automatic knock-out. However, there is considerable flexibility in the types of castings obtained, as the width and depth of the boxes can be varied over quite a wide range. The boxes are normally closed by clamps, with weights as an occasional alternative.

It takes approximately 25 min. for moulds to travel between the pouring station and the Eliptex automatic knockout. The latter is based on a parallel steel bar type of screen with bars 3-in. apart and size 4 by 7 ft., and furnished by Stone-Wallwork, Limited. The mould conveyor is 2-ft. wide and its plates have 5-ft. 6-in. centres; it travels at 14 ft. per min. Castings from the well-ventilated knockout fall on to a slat-type conveyor and thence are automatically loaded on to an overhead FE-line cooling conveyor, whence they are transported to an oscillating table (made by Ewart Chainbelt Company, Limited) for the removal of runners and gits. Empty moulding boxes are automatically lifted to the return belt and gravity conveyor for return to the machines.

Great attention has been paid in the moulding section to reducing labour requirements to an absolute minimum, and to ensure that working conditions are ideal for the operators. Sand from the knockout falls through a rotary table take-off unit faced with stainless steel and this passes under a magnetic separator to remove "tramp" iron; a rotary screen rejects unusuable sand and returns the balance to a main storage hopper of 120-tons capacity, where it has ample time to cool.

To reduce handling still further, the runners and gits when removed are placed in stillages and are conveyed to the cupolas by means of fork-lift trucks. Another point worthy of mention is that the overhead cooling conveyor for castings is designed to take an entire day's cast and thus can provide temporary storage capacity if required.

FIG. 3.—*Entry point of the continuous horizontal core- and mould-drying oven. There are* 300 *trays at* 4*-ft. centres.*



Sand Plant

Great attention is paid to see that a good unit sand is used and a Foundry Equipment S.B.3 model of continuous sand mill, of 30 tons per hr. capacity, and fitted with a water spray, is used. Additives of coaldust and bentonite are automatically fed into the sand system immediately before the sand mill. Conveyor belting, elevators and disintegrator are fairly conventional, but quite an elaborate sand-return system and large sand-hoppers have been provided to ensure that the sand is always supplied cool at the moulding machines. The large storage hopper of patented design is fitted with four Vee-ploughs at the top, and four extraction belts at its base, all designed to confer maximum flexibility and even distribution of sand, both for sand arriving from the knockout and for re-conditioned material. New sand is added—from a bunker situated outside the building—by means of a moving conveyor fitted with an adjustable plough to give correct proportioning. Eight straight ploughs, which are automatically commissioned from electronic hopper-level indicators arranged in the machine hoppers below, eliminate the necessity for labour on top of the platform above the moulding machines. Pneumatic opening and closing is used for control of sand delivery from the hoppers to the machines.

Coremaking

So as to minimize transportation, storage and breakages, the coremaking department is situated

close to the moulding section. Equipment installed here includes two Corall junior coreblowers and one TK305 V & S coreshooter, having a capacity of 13 lb., and normally producing cores from 4 oz. to 7 lb. A 1-ton per hr. capacity Fordath sand drier is used, as also is a 560-lb. batch-type sand mill, manufactured by the same company. The elevator which takes the new sand at the rate of 1½ to 2 tons per hr. to a height of 25 ft. was supplied by Sturtevant Engineering Company, Limited. The core and/or mould-drying oven (Figs. 3 and 4) was designed, built and installed by Controlled Heat & Air, Limited, to handle approximately 300 trays per hr. (maximum size 16 by 10 by 6 in.) at operating temperatures up to 288 deg. C. This plant is of the continuous monorail type with a wire-rope conveyor, having trolleys pitched at 2-ft. and carriers at 4-ft. centres. The air-heating gear comprises a self-proportioning fuel-oil burner with blower and motor and with a line heater. A re-circulating hot-air system is employed for the oven of capacity approximately 20,000 cu. ft. per min. Baking time is in the region of two hours and output approximately 1½ tons of cores per hr. The equipment is thermostatically controlled and fitted with electronic safety devices. The stove is fuelled by 200-sec. Redwood Britoleum fuel-oil and the oil-burning gear is by Schieldrop.

Annealing

The annealing cycle is the longest single operation and for it, the largest and most expensive piece of equipment—a continuous electric furnace (Figs. 5 and 6)—has been installed. The plant is continuous and capable of handling 100 tons of castings (of quite small average unit weight) per 160-hr. working week, for producing both ferritic and pearlitic grades of malleable iron. Castings from the oscillating table after the removal of runners and gits are packed into cast nickel/chromium baskets and are then fed into the high-temperature zone of the furnace. These baskets are 2-ft. 6-in. square and 13-in. high and are loaded three abreast, each basket being able to accommodate about 500-lb. of castings. Because the atmosphere is independently generated and controlled throughout the high-temperature annealing, no packing material is necessary. The baskets run on six rows of nickel/chromium alloy rails fitted with free-moving rollers. The time-cycle for the passage of castings through the high-temperature zone and the low-temperature furnace which follows is 20 hr. each. The total time for heating and soaking pearlitic malleable in the low-temperature furnace is 6 hr.

Furnace Layout

The high-temperature section of the furnace is rated at 730 kw. and divided into five separately-controlled heating zones. The maximum operating temperature is 1,000 deg. C. and the hydraulic pusher equipment is driven by a 10 h.p. electric motor. Traversing conveyors at the charge and discharge ends of the furnace are driven by 3-h.p. motors, the extractor conveyor at the end of the furnace a'so being fitted with a motor of the same

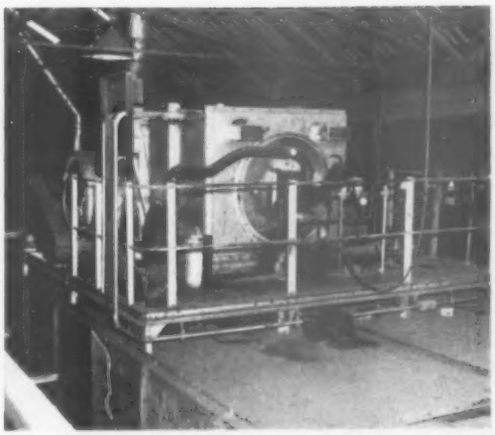


FIG. 4.—*Oil-fired air-heater on the top of the core- and mould-drying oven; a self-proportioning Schieldrop burner is incorporated.*

capacity. An air-blast station is situated between the high- and low-temperature furnace for the production of pearlitic malleable and here, by means of a motor-driven fan of 15 h.p., the temperature of castings can be reduced to 500 deg. C. within 5 min. The heated length of the furnace is 52 ft.; its usable width 9 ft., and loading height 1-ft. 6-in. As the whole of the furnace rests on the shop floor, no major foundations were required when installing it, and only minor excavation work was required—for cable trenches and access pits. As a result, the hearth elements can easily be removed and there is likewise easy access for clearing scale. The heating elements are robust, heavy-section angle chromium-alloy tape. Work is progressed through the furnace by means of a hydraulic pusher—one push per hr.—and this stroke transfers one set of trays at a time from the sealed canopy into the heating chamber.

The low-temperature section of the annealing furnace is rated at 460 kw. and has five separate controlled zones as follow: Zone (1), rated at 160 kw. and provided with half-heat control for dealing with ferritic malleable; zones (2) and (2a), each rated at 60 kw. and zones (3), (4) and (5), each rated at 60 kw. The maximum operating temperature of this unit is 800 deg. C. and the heated length, usable width and loading height to the arch spring are the same as for the high-temperature section.

The low-temperature furnace is not atmosphere controlled and there is a side discharge for the extraction of castings for which a pearlitic structure is desired. On such occasions, three empty trays need to be loaded to replace the pearlitic tray discharge so as to ensure continuity of conveyance of ferritic castings already in the letting-down section of the furnace.

All the equipment fitted on the furnace is automatic in operation, the central control being by

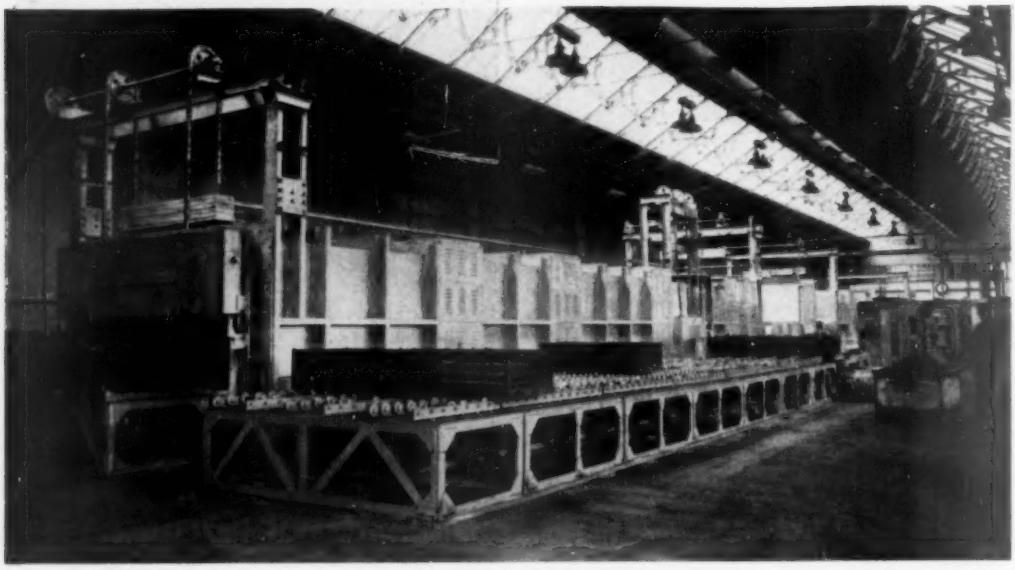


FIG. 5.—*"Metalectric" dual-purpose (ferritic and pearlitic) continuous electric malleablizing furnace for handling* 100 *tons of castings per* 160-*hr. week at Cwmbran.*

hand-operated drum-type unit, having interlock features to ensure that the various motors follow the correct sequence. The main transformer is of 1,200 kva., three-phase, 50 cycles supply, and has an oil-immersed self-cooling no-load voltage ratio of 11,000:400 v. with star/delta connections. The control of temperature on the two furnaces is obtained by two Electroflo "Millivolt" meter controllers and three "on"/"off" temperature controllers.

Cleaning, Fettling and Straightening

After the annealing operation, castings are transferred to the fettling department where equipment available includes one 7-ft. 6-in. dia. rotary-table shotblast unit and two rotary Centriblast barrels (by Spencer & Halstead, Limited), four double-ended 24-in. pedestal-type grinders (by Luke & Spencer, Limited) and various Thor tools (by Armstrong Whitworth (Pneumatic Tools), Limited). For straightening castings after annealing, there are two presses. The first of these is a Mills 30-ton "Oilaulic" vertical open press; this has a self-returning hand-and-foot return-valve operating lever, advance and return speeds of 200 in. per min. and power at 28 in. per min. The second press, also of Mills design, is an 80-ton "Oilaulic" vertical open-front press, with advance and return speeds of 140 in. per min., and power at 20 in. per min.

Other Departments

Warehousing and Despatch

Immediately beyond the fettling section, there is a very large area for warehousing, and the despatch area—which can be serviced by either road or rail—adjoins the warehouse. Here again, castings are stillaged and conveyed by either hand-lift or fork-lift trucks, thus reducing manhandling to a minimum.

Laboratory Control

In order to produce both ferritic and pearlitic malleable castings with properties necessarily well in excess of the requirements of the appropriate British Standard Specifications, it is necessary to institute close metallurgical control. This is achieved at Cwmbran by the use of a well-staffed and well-equipped laboratory, which incidentally also serves the cylinder-block and grey-iron foundries. A Lamson tube has been installed to convey samples between the melting shop and laboratory—a distance of about one-third of a mile. All raw materials are analyzed, and metal from the cupolas and arc furnace is sampled and examined at 20-min. intervals. No material is passed for use unless it complies with the very rigid specifications set down by the company's technical department. Pouring temperatures also are under close supervision and the provision of test-bars follows closely with the production pattern, so that they are representative of the metal throughout the day's production.

The continuous annealing oven represents the most efficient approach to controlled annealing yet possible, enabling the metallurgists to adjust soaking and heating rates to very closely-controlled limits. Castings emerging from the annealing ovens, both of pearlitic and ferritic grades,

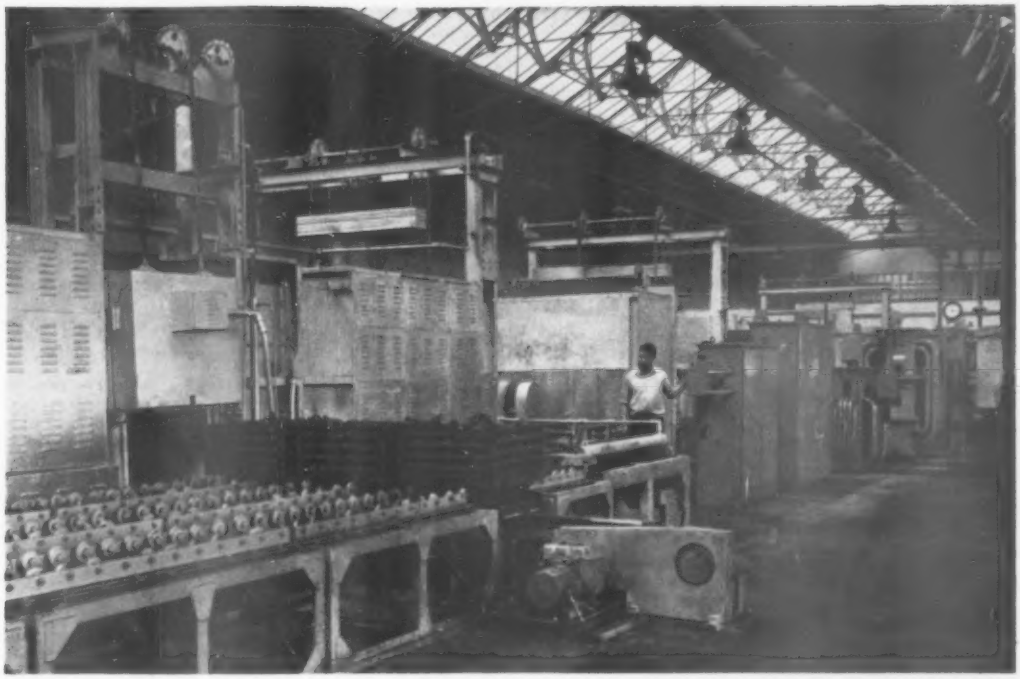


FIG. 6.—*Second view of the continuous annealing plant, showing the "pearlitic" discharge mechanism of the low-temperature section of the unit.*

are subject to a rigid inspection—including a Brinell hardness check—to ensure that components passed to customers will give satisfactory machining performance.

The company has its own playing fields in Cwmbran, where cricket, soccer and rugby football are catered for. In common with other members of the Group, the company regularly makes awards to employees attaining 30, 40, 50 and even 60 years' service. It is interesting to note that when this scheme was inaugurated at Cwmbran in 1947, there were 180 awards for the whole of the works, including nine for 60 years' service or more. There is also a non-contributory pension scheme, carrying life-assurance to the value of £500 for all male works employees.

Acknowledgments

The writer gratefully acknowledges permission from the GKN Group to publish this account of their extensive development at the Cwmbran Works and in doing so, congratulates all concerned in a most worthwhile achievement. Readers of the account will undoubtedly join in admiration for the pre-planning of the scheme no less than for its brilliant execution. Courage was needed to launch production of malleable on this scale—on "seas" hitherto unchartered by the Group, as it were—and it is the writer's fervent wish that such courage and boldness will not go unrewarded.

Finally, thanks are due to the firm's staff, the main contrators and subcontractors for help in preparing and illustrating the account.

Iron-ore Imports

Imports of iron ore and concentrates (except chrome iron ore) and roasted iron pyrites in October, and the totals for the first 10 months of this year and last, are shown in the table below.

From	Month ended Oct. 31	Ten months ended October 31	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Sierra Leone	61,380	613,372	475,661
Canada	322,441	2,966,134	2,187,545
Other Commonwealth countries and Eire	810	24,389	9,586
Sweden	330,740	3,944,894	4,042,098
Norway	14,200	268,475	235,955
France	29,040	467,120	396,925
Portugal	6,731	322,927	133,468
Spain	82,967	637,158	616,765
Algeria	107,595	1,716,626	1,280,955
Tunisia	56,210	595,785	403,428
Morocco (including Tangier) ..	92,268	642,652	450,834
Liberia	33,110	415,530	402,461
Venezuela	13,850	1,378,462	1,509,411
Brazil	29,294	502,969	479,628
Other foreign countries	33,074	652,340	519,166
TOTAL	1,214,340	15,148,833	13,143,886

Equipment and Supplies

Warning System

Gresham Automation, Limited, Hanworth, Middlesex, have designed and are manufacturing a new type of fault warning system for monitoring and calling attention to faults in any type of automated system. It is designed to actuate audible warnings through loud-speaker amplifiers, through buzzers and also by visual indication of the location of the fault whether at points on the plant, in the control room, or both. The manufacturers state that the system can also be used for indicating and, by suitable connections, recording fleeting faults which occur and correct themselves before a supervisor has had time for action. Systems can be supplied complete with a central display panel containing all signal points and legends or as circuitry only, and may be powered by a Gresham power-pack or from any low-voltage d.c. source such as a battery.

Water Clarifier

Paterson Engineering Company, Limited, 129, Kingsway, London, W.C.2, have designed their "Centrifloc" clarifier for the treatment of all types of water, either silted or colloidal. The makers claim that the new unit is simple to operate and state that it can be made in sizes with diameters as small as 9 ft. to as large as 160 ft. The clarifier normally works at a vertical-flow rise rate of four to six ft. per hr. with a tank depth usually not less than 15 ft., the clarified water being drawn off from the top surface-area of the tank by means of radial collecting-troughs with hydraulically-spaced orifices.

Belt Weighers

A new range of totalizing belt-weighers is announced by W. & T. Avery, Limited, Soho Foundry, Birmingham, 40. These scales, the makers state, are adaptable to meet a wide variety of requirements for totalizing the weight of material passing over a conveyor belt and the machines are designed to fit into an existing conveyor-system and are suitable for horizontal or inclined installations. The totalized weight is shown on a seven-figure counter and a pendulum-type indication provides a continuous check of rate of feed. Remote totalizing and indication of rate are also available.

X-ray Unit

English Steel Corporation, Limited, River Don Works, Sheffield, has been supplied with a 6,000,000 v. X-radiographic unit by Vickers Research, Limited. The unit incorporates a six "MEV" sealed-off linear electron accelerator and will be used for the examination of steel of thicknesses up to 12 in. English Steel Corporation is the first steel company in the UK to introduce a linear electron accelerator for the examination of steel castings, and state that as the unit is compact and manœuvrable, the range of products which can be inspected is extensive.

Pneumatic Drills: B. O. Morris, Limited, Briton Road, Coventry, announce the release in the UK of a new series of Grasso straight-grip pneumatic drills made in Holland. The chucks are shrouded for safety and almost silent in operation and the bodies of the drills are sheathed in plastic, which insulates the operator's hand from the cold metal. Speeds available are 500, 900, and 1,500 r.p.m. with $\frac{3}{8}$-in. chuck for stainless steel, nimonic and other alloys, and 3,800 r.p.m. with $\frac{1}{4}$-in. chuck for general workshop use and for motor and woodworking industries.

Metal Cleaning: The Castrol Group announce the formation of a new subsidiary company known as Bladite, Limited, which will specialize in metal cleaning by mechanical means, including shotblasting, in metal spraying and in the application of protective coatings. The work can be carried out in the company's Liverpool works or on the site where advanced equipment and a new dust-free process will be used. While, at first, these services will be confined to the North of England, the company hopes soon to operate on a national scale. The offices of the company are at 2 to 8 St. John's Road, Bootle 20, Lancashire.

Fire Extinguishers: A new range is being marketed by Nu-Swift, Limited, Elland, Yorks. They carry the Kite mark of the British Standards Institution, and are made to BS. 1721. The new "Plus" units are pressure-charge-operated, and contain either chlorobromomethane or carbon tetrachloride with carbon-dioxide added. The makers state that pressure charges for their old types of extinguishers will continue to be manufactured for present users for the next 10 years or so.

Container Level Indicator: Lancashire Dynamo Electronic Products, Limited, Rugeley, Staffs, announce the "Quantimeter" for continuous indication of the level of stocks either at the container or, alternatively, at a remote-control data-recording point. The indication is linear from zero to maximum, six capacitance ranges being provided to ensure that the equipment can be used for a wide variety of materials.

Polarograph: Evershed & Vignoles Limited, Acton Lane, London, W.4, have recently introduced the Mark 200 polarograph. Industries with outpourings of waste liquid have to control the level of certain impurities in their effluent, and this unit, the makers claim, offers a fast and accurate method of measurement and can be used by semi-skilled personnel.

Flame-plating Process: Union Carbide, Limited, Millers Road, Warwick, announce that as from December 1, they will, by arrangement with John Harris Tools, Limited, take over responsibility for operating the flame-plating process, at present undertaken by John Harris Tools. The latter company will continue to sell flame-plated screwing tools and gauges.

Mr. ARTHUR SYKES, a director and technical consultant of David Brown Industries, Limited, was presented with a television set on behalf of employees and directors on December 1, to mark his retirement after nearly 57 years' service. The presentation was made at the Park Works, Lockwood, Huddersfield, by Mr. ALAN AVISON, deputy managing director of the David Brown Corporation, Limited. Mr. Sykes joined the company in 1905 and he has been successively chief engineer, works manager, engineering controller and technical director. He holds the OBE, and is a member of the Institution of Mechanical Engineers, the Institution of Production Engineers and the Society of Automobile Engineers.

Yttrium-containing Spheroidal-graphite Iron

Among the "highlights" of the annual meeting of the American Society of Mechanical Engineers, held recently in New York, was a session dealing with spheroidal-graphite iron. One of the papers presented at this session was entitled "Yttrium S.-g. Iron" and was written jointly by Mr. J. J. Kanter, Mr. J. P. Magos, and Mr. W. L. Meinhart (all with Crane Company, Chicago), Mr. Kanter actually reading the paper at the meeting.

Background

In his opening remarks, Mr. Kanter said that during 1958, an investigation was undertaken to determine whether the element yttrium* was a nodularizer for cast irons and the results of the investigation, he said, demonstrated that the element was, in fact, an efficient nodularizer with characteristics uncommon to magnesium and cerium—the most well known of nodularizing elements to date. Mr. Kanter added that this discovery was covered by Patent application pending in a number of countries.

Mr. Kanter then briefly discussed the reason why the use of magnesium for nodularization had grown so significantly, whilst that of cerium had remained secondary or, perhaps, only incidental. Continuing, he said, however that studies showed that about 7-lb. of Mischmetal per ton of molten iron were actually required for nodularization of commercial iron, or about $20 worth. Magnesium master-alloys, selling as high as $6 per lb. of contained magnesium were being used in many US foundries. However, owing to the high volatility of magnesium at the temperature of molten iron, ladle-transfer and deep-plunging techniques in numerous operations achieved a retained magnesium efficiency sometimes not more than 20 per cent. and thus, US founders found that magnesium master-alloy costs were comparable with Mischmetal.

He said that the same graphite distribution associated with an 0.05 per cent. concentration of magnesium would require about 0.30 per cent. of cerium, and such a concentration was untenable. For this practical reason, one must compromise at a cerium concentration well short of that at which compact graphite structure was attained. An addition agent, which combined the nodularization character of magnesium with the low volatility of cerium was therefore desirable, and the investigations carried out had shown that yttrium provided such an advantage. Mr. Kanter then considered the following comparison of properties of magnesium, cerium, yttrium and iron as follow:

	Melting point deg. C.	*Boiling point deg. C.*
Magnesium	650	1,107
Cerium	795	3,470
Yttrium	1,500	3,032
Iron	1,536	3,000

* Yttrium (symbol Y or Yt), atomic weight 88.92; specific gravity 5.51; melting point 1,500 deg. C.; a rare-earth element.

From this comparison, the lecturer said that it could be seen that the temperature of molten iron was hundreds of degrees above the boiling point of magnesium, whilst the boiling points of cerium and yttrium were well above that of the iron itself. At the ladle temperature of molten iron, the vapour-pressure of the magnesium was 10 to 15 atm. (150 to 225 lb. per sq. in.). At this same temperature, the vapour-pressure of yttrium was less than 1-mm. Hg, or about one-one thousandth of an atmosphere. Thus, the "pouring" vapour-pressure of magnesium was more than 10,000 times that of yttrium. At 1,426 deg. C., the magnesium content of the treated iron faded at the approximate rate of 0.01 per cent. for each 10 min. held after treatment. The fading time for yttrium appeared more prolonged and was controllable by flux covering, since the loss occurred primarily by surface oxidation. Yet again, yttrium could be plunged into the iron without evidence of flash and could be added in concentrations up to 0.05 per cent., without producing abnormal chill in the castings.

Practice Melts

Mr. Kanter said that the original demonstration which was carried out to show that yttrium had a nodularizing character in iron was made by preparing a series of 10-lb. induction-furnace melts to which yttrium was added as a silicide. A keel-type test-block, using a dry-sand core, provided a tensile specimen of 0.253-in. machined diameter; as-cast and heat-treated properties resulting after 718 deg. C. were recorded.

Typical test results on 23 melts, induction-melted, were given as follow: Pure yttrium chips (about 0.30 per cent.) were introduced to the furnace metal at about 1,538 deg. C., by a plunging technique, to accomplish immersion without "burning." The melt was then transferred at a temperature of about 1,480 to 1,510 deg. C., to 150-lb. ladles containing ferro-silicon inoculant, each melt providing a series of six such ladles.

Mr. Kanter said that there was little disruption of foundry routine when using yttrium as it eliminated pyrotechnics. If an addition of yttrium of about 0.25 per cent. was made to molten iron (5 lb. per ton), it usually would still be present in the castings at 75 per cent. or more of this same concentration, depending on melting, pouring and fluxing. An indication of the retention of the yttrium effect in iron was that several remelts of foundry shop-return scrap in the induction furnace had been found to attain a sufficiently nodular structure to give elongations up to 10 per cent., using only a very mild reinforcement of nodularizer. Presumably, he added, the desulphurizing accomplished by the yttrium during remelting was involved in this effect. The spheroidal-graphite foundry's problem of utilizing its shop returns might be given a new

dimension by virtue of this effect, but further study of this aspect of yttrium utilization must be made.

Results

Typical figures for laboratory melts of yttrium-containing s.-g. iron for a chemical composition of approximately C 3.5, Si 3.0, Mn 0.30, S 0.015, P 0.05, Ni 0.02, Y 0.2 (and Ti, Cr and Mo in amounts of 0.03 per cent. or less) are as follow: Mechanical properties as-cast, tensile 29.0, yield 21.0 tons per sq. in., elongation (on 2 in.) 18, and reduction of area, 8 per cent., BHN 182. After heat-treatment, such material gives 30.8 tons tensile and 20 tons per sq. in. yield respectively, 21 per cent. elongation, 7 per cent. reduction in area and BHN 175.

Representative values from 23 field-test melts of yttrium-containing s.-g. iron (0.3 per cent. yttrium added in the furnace) for a chemical composition approximating to C 3.15, Si 2.5, Mn 0.25, S 0.015, P 0.05, Ni 1.0 and Y 0.25 (with Ti, Cr and Mo again present in amounts of 0.03 per cent. or less), properties after heat-treatment show tensile 29 tons in ½-in. section and 26.8 tons per sq. in. in the 1-in. section, with equivalent yield strengths of 21.4 and 20.5 tons, and elongations of 20 and 17 per cent. respectively. For average hardness (BHN) on a 1-in. "Y" block, the respective figures are 190 (as-cast) and 170 (heat-treated).

Summing up, the authors stated that yttrium had the following advantages: (1) Complete elimination of "flash" difficulties; (2) lower sensitivity to chill factors; (3) wide range of effective concentration; (4) short-cycle response to heat-treatment; (5) retention effect upon remelting; (6) less control of process needed; (7) little disruption of foundry routine where continuous s.-g. iron production was not employed, and (8) establishment of a use for impure yttrium and yttrium metals. Finally, the paper stated that the economic margin afforded by these possibilities had not yet been assessed, but it was necessary for the nodularizing additive to be produced at a price which would open up its advantages to the foundry industry.

Discussion

The discussion following the presentation of this paper emphasized the experimental status of the work described. Mr. Kanter reported that the practice at the Crane Company was to process the material into handwheels for valves and other commercial castings under his company's trade name "Flex-Iron." The discussion dealt with economics, sources of the material as a by-product of atomic-energy research and its expected cost to foundrymen (stated to be in the magnesium or cerium cost ranges of s.-g. iron treatment). Emphasis was placed upon the lowered risk of chill formation if metal was overdosed with yttrium above its 0.30 per cent. desired level or with as high as 0.50 per cent. (overdose).

Ancient Cannon Foundry

By T. R. Harris

Information concerning foundries of the early and pre-industrial revolution period is difficult to obtain, but occasionally interesting facts come to light from the most unexpected sources. As an illustration of this, in an address delivered at the City Road Chapel, London, in October, 1860, reference was made to the "Foundery," which became the first preaching house of the Wesleyan Methodists in London.

In the course of his remarks the speaker stated that during the early days of the Methodist movement it was difficult for the brothers John and Charles Wesley to find a church in London willing to accept them as preachers. Subsequently two gentlemen came to John Wesley and advised him to take a derelict building, in the neighbourhood of Moorfields, known as the "Foundery," and to adapt it to his purposes. This was subsequently carried out and it is recorded that "the Foundery was a large unsightly brick building then in ruins." It was, however, quickly made into a serviceable chapel.

The reason for its derelict condition was commented on by the speaker of 1860, who said: "The Foundery was a place formerly occupied by the Government where cannon were cast for the army and navy. As it was inconveniently near London, crowds used to press to see the process and at last a terrible accident occurred. A young man from Switzerland went to see the process. He was an ingenious man; he saw a quantity of water in the mould and gave the alarm. He said, "If you pour your metal into that mould the water will be converted into steam, an explosion will take place and perhaps the building will be destroyed." They ridiculed the warning and poured the metal. A terrible accident occurred, many persons being seriously injured and the whole building shattered. It was resolved then to remove the foundry from London to Woolwich where it remains to this day. After the calamity an advertisement was issued by the government requesting an interview with this young man, who accepted the invitation, and to his superintendence was committed the new foundry."

It was stated further by the speaker that some 20-odd years previous to his address, when the centenary of the founding of Methodism was being held, "a descendant of that young man, bearing the same name, then held an important office at Woolwich" and was present at the service held at City Road.

From another source we learn that "the Foundery had been opened for preaching on November 11, 1739." Also from a letter dated October 18, 1776, we are told that "The Foundery with all the adjoining houses is shortly to be pulled down." The building was last used by Wesley in August, 1779.

The locality of the foundry was called Windmill Hill, Upper Moorfields, London, and was a street running parallel to City Road. It was on the east side of the street and the entire premises occupied "a space of ground measuring about 120 to 130 ft. in front from north to south, and about 100 ft. in depth from east to west."

COLT VENTILATION, LIMITED, of Surbiton, Surrey, announce two new appointments:—MR. GEORGE STUART WARD has joined the company as group personnel manager for both the head office and factories, and MR. ALFRED WILSON, M.Eng., A.M.I.Mech.E., M.Inst.Pet., M.Inst.F., takes up a key position in the development and design division.

New Social Club for Lake & Elliot, Limited

Lake & Elliot Limited's sports and social club's new building at Chapel Hill, Braintree, Essex, was officially opened last month, when Mr. C. J. Lake (chairman of Lake & Elliot) unlocked the front door with a gold-plated key. Speaking to members of the social club in the forecourt, he said that he hoped they would appreciate the new building and make it as much a success as the former one (for the latter, three standard-unit buildings had been converted into one and this had served fairly adequately for the last 12 years). The guests at the opening ceremony were welcomed by Mr. C. H. Kain (managing director) and he was afterwards presented with a gold-plated key, similar to the one used by Mr. Lake. Bouquets were presented to Mrs. C. J. Lake and Mrs. Kain. Other guests present included directors of the company, the contractors, old-age pensioners (who are honorary members of the club), Mr. C. Walker (chairman, Braintree Urban District Council), Mr. E. A. Parish (chairman of Braintree magistrates) and Police Supt. H. E. Wood.

Facilities Available

The main hall has been built on to the old Victoria Inn, now completely altered inside and forming part of the club. Architect of the new building is Mr. L. S. Richards, works engineer, of Lake & Elliot, Limited. Facilities at the club, views of which are shown in the illustrations below, include billiards and snooker room, a table-tennis room, secretary's room, a large main hall, a bar, two lounges, and a television and card room. In the basement of the building are a rifle range and committee rooms. A new pavilion at the club's sports ground in London Road, Braintree, was opened earlier this year.

Chemical-engineering Congress and Exhibition

Over 2,000 chemical engineers are expected to come to London next June from all parts of the world to attend the Third Congress of the European Federation of Chemical Engineering. The Congress (which is to be held at Olympia, London, from June 20 to 29) will be organized for the European Federation by the Institution of Chemical Engineers (of Great Britain). Running at Olympia at the same time will be the second Chemical and Petroleum Engineering Exhibition, so that delegates will have the added advantage of being able to see for themselves the best and most up-to-date applications in industry. About 80 technical papers will be presented during the Congress, and simultaneous translation into French, German and English will be provided; over half the papers being contributed by overseas authors. The Congress will consist of four symposia, the Institution of Chemical Engineers organizing the first three, and the fourth (sponsored by the Institution of Chemical Engineers, Institute of Physics and the Physical Society and Society of Chemical Industry) is being organized by the Society of Chemical Industry.

Course on Computers

The Purchasing Officers' Association is holding a course at the College of Aeronautics, Cranfield, from January 8 to 11, on computers in purchasing and stores departments. This is the second such course organized by the Association. The leader will be Mr. J. W. Wright, M.A., lecturer in industrial administration, Manchester College of Science and Technology, Manchester University. Full details of the course can be obtained from the education officer, Purchasing Officers' Association, Wardrobe Court, 146A, Queen Victoria Street, London, E.C.4.

Lake & Elliot's new social club facilities—the left-hand illustration shows the main hall as set out for badminton, showing the ample space also for side tables; on the right is a part of one of the two lounges of the club with its own bar. The opening ceremony was performed by Mr. C. J. Lake, supported by Mr. C. H. Kain and other directors.

Notes from the Branches

Northampton Section

"Recent Developments in Foundry Processes" was the title of the paper presented by Mr. J. D. Hill, B.SC., to the Northampton section of the Institute of British Foundrymen at the October meeting in Wellingborough.

Mr. Hill covered a wide range of equipment beginning with the sand mixer and ending with melting processes. He described the conveyor-belt-type of sand mixer with capacities up to 200 tons per hour, and surprised his audience by saying what good results he had seen from such a mixer in Sweden, and how samples taken from the discharge belt did not show an increase in strength by further milling in a batch mill.

High-pressure moulding by the use of blow/squeeze and diaphragm machines was explained and reference was made to experiments being conducted with squeeze pressures on the sand in a moulding box up to 1,000 lb. per sq. in. of box area, as against the normal range of 50 to 60, which, incidentally, is probably regarded as high by some foundries. The use of a slurry for adding coal-dust and bond to the sand was explained, the great advantage being, of course, the reduction in dust at the point where these additions are made.

Sand cooling by passing it through a drum similar to a sand dryer; the conveyance of dried sand, and even prepared moulding sand and core sand by pneumatic conveyor interested the members as did Mr. Hill's references to melting equipment, in particular the latest process for melting borings in the cupola. He also referred to the possibilities of direct reduction processes from iron-ore.

Discussion

Question time was very well supported and the following are only a few of the queries which were raised:—

MR. FORD said that he was interested in the much avoided problem of cooling moulding sand and believed that a rotating barrel with air drawn through it was the only realistic method, though this equipment might have to be of considerable size.

MR. HILL confirmed that adequate moulding-sand cooling could only be carried out at very substantial cost and said that he thought the barrel-type cooler was the most suitable one. He also mentioned the type of cooler in which the sand was cascaded down a tower, the cost of which was also substantial.

MR. BOLTON asked what was the difference between this new method of feeding borings into a cupola melting zone and the previous one which was introduced about 10 years ago. He said his experience of this sort of equipment was that a large proportion of the borings ended up on the cupola-house roof and he favoured the use of mains-frequency induction-furnaces.

MR. HILL agreed that borings on the foundry roof were not entirely unknown. He said that the essential difference in the two systems was that the latest process shot a given charge of borings which penetrated deep into the melting zone at regular intervals, whereas the earlier process was more of a continuous trickle feed and this sometimes fed very irregularly due to part fusion of the material.

MR. HIRD asked if sticking trouble would be experienced at bends when moving mixed core sand in a pipe-line.

MR. HILL agreed that bends were the most likely trouble spots but said that boost air would be injected at such points to overcome this difficulty.

MR. JELLEY referred to the continuous desulphurizing process described by Mr. Hill and asked if there were any special difficulties in operating the process on an industrial scale.

MR. HILL stated that trials had been carried out on an industrial scale and the only indications of trouble were with the refractory lining of the separation box. It seemed likely that the most suitable material would be tar-bonded dolomite.

Mr. H. Edge (past-president) thanked Mr. Hill for coming from the British Cast Iron Research Association to speak. He said how much the smaller firms in particular valued this information because they did not normally have the opportunity of trying out so many of the new ideas as the bigger concerns. The vote of thanks was seconded by Mr. R. W. Pipes who, although a member of the London branch, is well known in the Northampton section and a frequent attender of their meetings.

The Rt. Rev. Cuthbert Bardsley, C.B.E., M.A., D.D., Bishop of Coventry (extreme right) chatting to (left to right) the IBF president, Mr. D. A. Richards, Mr. D. P. Smith (Birmingham branch president) and Mr. J. Malin (Coventry section president) at the annual banquet and dance of the Coventry section at the Hotel Leofric last month.

Dr. Everest honoured

Dr. A. B. Everest, who has devoted his career to the development of alloy and special cast irons, completed 35 years with the Inco-Mond organization on October 31. The event was marked by the presentation of a gold watch at the company's Quarter-Century Club dinner last week. Dr. Everest, a past-president of the Institute of the British Foundrymen and of the International Committee of Foundry Technical Associations, is now manager of the applicational engineering division of the Inco-Mond Development and Research Department, in London.

FOR THE 25TH TIME GLENCAIRN METALS, LIMITED, have won the Motherwell & District Industrial Savings League. On this occasion the savings group of the firm has scored 113.55 points, *i.e.* seven points more than Russell's Brassfoundry, the second group in the League.

Thin-walled Moulds*

By B. V. Rabinovich, B. P. Platonov, and F. F. Rezinskikh.

In 1944, a method was suggested in the USSR for the making of thin-walled moulds by blowing a sand mixture into the space between the pattern and a shaped flask, and named the R-process. Investigation of the structure of iron castings from 10- to 30-mm. thick, cast in thin-walled moulds, demonstrated the absence of cementite even with only a 5-mm. thickness of sand. The process had some defects along with advantages, and as a result of lengthy research and experiments, it underwent modification and was considerably improved. The results of the studies carried out were used in developing a new process of moulding "Volga" engine crankshafts. At present, the process of moulding has been divided into two stages—at the first stage a sand layer or shell is preliminarily shaped by the blowing method, and at the second, a final "differentiated" squeezing is effected at a high pressure. In mass-production, a shaped flask is used as a support of the thin shell, but in a batch-type production, the mould is made with stiffening ribs which impart structural strength without the use of flasks. The economic advantage of the process lies in a reduced consumption of moulding materials, low costs of the binding materials used, and in the high productivity of labour.

When considering a conventional sand mould in service, it is possible to visualize a two-part structure, namely, a comparatively thin layer (or shell), and a thick layer behind it (the filler or backing). The "shell" of any mould performs essential functions, namely, it imparts the required shape to a casting and ensures the production of a sound casting with accurate dimensions and a clean surface. To meet these requirements, the shell must possess certain working properties—strength, refractoriness, permeability—and should yield during the contraction of a casting. The backing does not participate in the formation of the casting, its only duty being to provide a support for the shell. At the same time, the backing hinders escape of gas from the mould, its provision requires more labour in sand preparation, moulding and knocking-out and consequently it may be considered as superfluous.[1]

Various attempts aimed at preserving the shell—the useful part of the sand mould—and at getting rid of the filler or backing, have been elaborated upon in the history of the technical development of moulding during the last two decades. The following processes, well known in Western Europe and in the USA, may serve as examples—the C-process[2], the D-process[3] and, to some extent, the method of squeezing moulds by means of a rubber diaphragm.[4] This present paper describes the development of the method of making thin-walled moulds, worked out in the USSR† and known as the R-process.

The first suggestion dates from 1944.[5(a)] As required by this process, a shaped flask (Fig. 1 (2)) is placed on the patternplate, its inner surface being made according to the outline of the pattern (1) in such a way that a clearance is formed between the flask and the pattern. Moulding sand (3) is blown into this space through the flask or the patternplate; the pattern is then withdrawn, whilst the moulding sand remains and is held firmly by the flask, and the mould is assembled and poured in the usual way.[6]

Preliminary Work

The equipment used did not involve great expenditure—the patternplate was of a conventional design, the only difference being that vents were placed in it for escape of air; the shaped surface of the flask was not machined, only the joint surfaces being planed. The flask was provided with a slit, Fig. 1 (4), to blow in the sand mixture and holes (5) were drilled in special bosses for allowing gas escape from the sand layer during pouring. To prevent the sand from being blown out from the holes, the bosses (5) reached the surface of the flask, which pressed it to the plate of the sand-blower chamber (6), Fig. 1.

An investigation was made of the effect of the layer thickness of the moulding sand on the thermal condition and on the structure of the grey-iron castings from it.[7] For this purpose, discs 250-mm. dia. and 10-, 15-, and 30-mm. thick, were cast in shaped flasks with layers of facing sand, 5-, 8-, 15- and 40-mm. thick. To compare their structures, discs of the above thicknesses were also poured simultaneously into a chill, without facing. The chemical composition of the discs corresponded to that used for automobile castings. Fig. 2 shows the structures of 15-mm. thick discs.

It appears that even with a thickness of the sand layer of only 5 mm., there is no cementite in the structure and flake-graphite is obtained instead of

* Paper presented at the Vienna Congress organized by the International Committee of Foundry Technical Associations. The first named of the Authors is assistant professor, and master of Technical Sciences, Automechanical Institute, Moscow; the second is foundry superintendent, automobile plant, Gorki; and the third is senior engineer, Automechanical Institute, Moscow.

† The investigations were carried out by the Foundry Department of the Moscow Automechanical Institute and the foundry department of the Research Institute of the Automobile Industry Technology; industrial tests were made at the automobile plant in Gorki.

Thin-walled Moulds

rosette-shaped, eutectic-graphite characteristic of castings that have been made in chill moulds (Figs. 2(*a*), (*b*), (*c*) and (*d*)). At the same time, when the facing of sand is of a small thickness, the pearlite is of a finer structure than in a conventional sand casting. With a thickness of facing amounting to 15 mm., the graphite becomes coarser and ferrite appears (Figs. 2(*e*) and (*f*)), and with a layer of 40 mm., the structure is the same as when pouring grey iron into conventional sand moulds (Figs. 2(*g*) and (*h*)).

In 1948, the process described earlier was tested to produce moulds for conventional bushings, and in 1952, for automobile and tractor-engine cylinder-liners. The task set in this case was to produce sound castings in moulds with a facing about 10 to 15-mm. thick, of an ordinary greensand and clay mixture, with a compression strength of about 0.5 kg. per sq. cm. 7 lb. per sq. in. The mixture had low flowability and was hard to blow. It should be noted that at that time, the theory of the sand-blowing process was little developed and there were only the data of one systematic investigation available.[8] The absence of any clear viewpoint regarding the mechanism of compaction of the sand mixture in the sand-blowing process made it difficult to apply the method of making thin-walled moulds. However, as a result of experiments, improvements were introduced in the sand-blower chamber and a lower ring-supply of air and an agitator were constructed. Following this, it became possible to blow moulds, but the density of the sand/clay facing was not stable.

Improved Methods

A decisive improvement in the quality of sand compaction was reached in 1953 by combining the sand-blowing process with pattern squeezing.[9] A large set of grey-iron dry liners was cast by this method for truck diesel engines. These are ground not only on their inner surfaces, but all over their outer surface as well; they were, therefore, suitable components for checking the process. There were apprehensions that the thin layer of the "green" moulding sand in contact with the metal wall of the flask might cause gas blowholes. However, on machining a large batch of castings, such defects were not found.

The same experiments made it possible to reveal some drawbacks to the process, however, the elimination of which called for a search for new methods. The disadvantages encountered were: (1) Blowing the moulding sand into the shaped flask required a greater accuracy of machining and maintaining it in position during the course of operations: (2) the bosses in which the holes were drilled for blowing the moulding sand into the shaped flask, as well as for gas removal, added some weight to the flask, and (3) the presence of a relatively thick layer of sand along the blowing slit retarded cooling of the casting at this position. Also, when pouring liner castings with very hot metal from an electric furnace, porosity was sometimes recorded in this zone.

Two Variants

Two variants of the new processes elaborated with the aim of eliminating the defects mentioned earlier are shown in Figs. 3 and 4.[5(b), 10] The basic idea consists of dividing the process of making moulds into two stages—in the first stage, the layer of moulding sand is preliminarily shaped and is initially compacted by the sand-blowing method, and in the second, it is finally consolidated by squeezing. In the first variant (Fig. 3), the shaped wall of the flask serves, as before, as a support for the layer of sand, whilst in the second variant, the required strength of the thin-walled mould is secured by the addition of stiffening ribs. In the first variant, the sand layer may be green or dry, whilst in the second, only dry-sand should be applied.

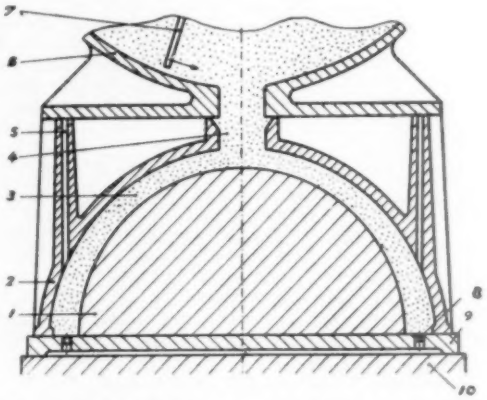


FIG. 1.—*Principle of making a thin-walled mould:* (1) *pattern;* (2) *shaped flask;* (3) *facing layer (or "shell");* (4) *blowing slit;* (5) *holes for gas escape during pouring;* (6) *sand-blower chamber;* (7) *agitator;* (8) *air-escape vent;* (9) *patternplate, and* (10) *moulding bench.*

Detailed Procedures

First Variant:

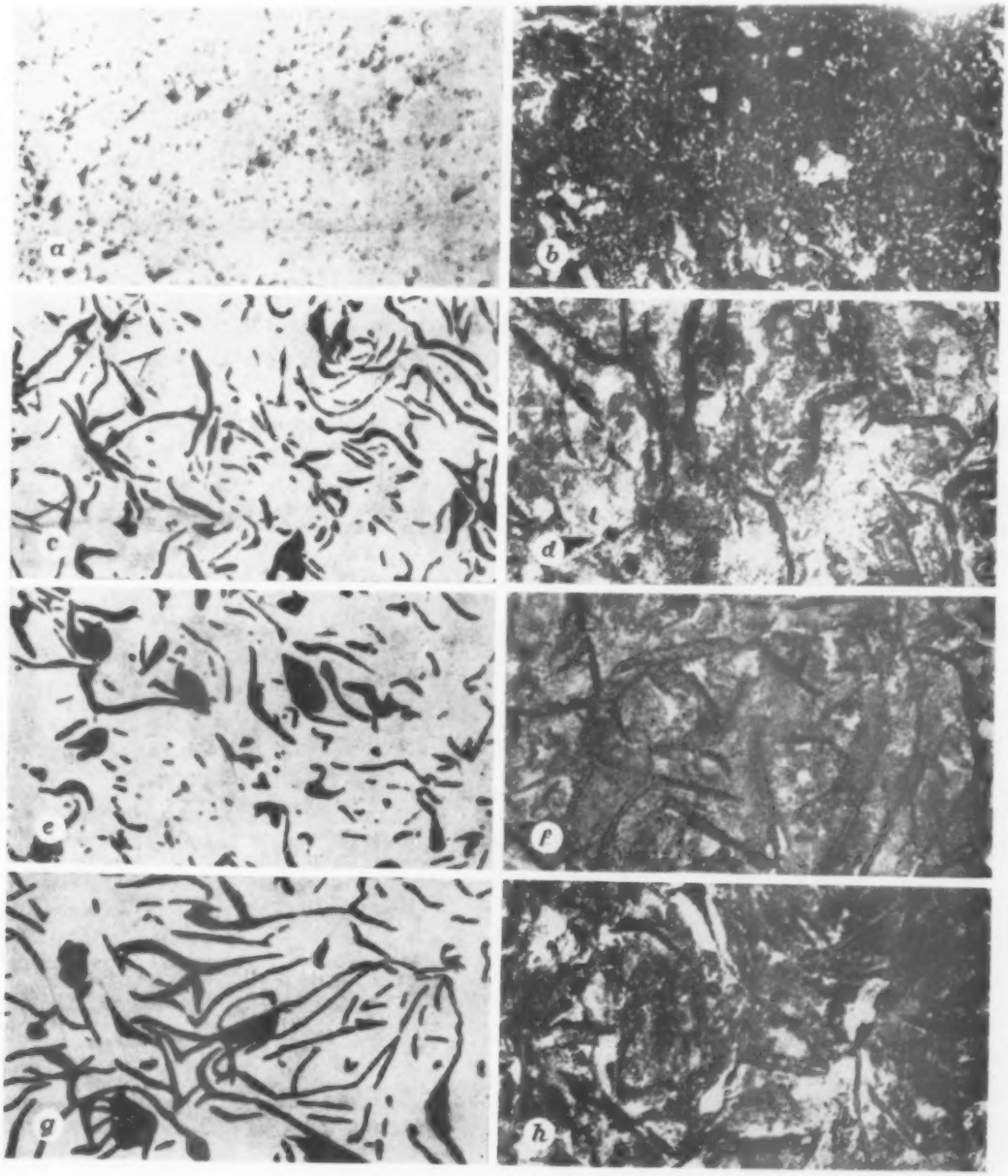
Moulding according to the first method consists of the following operations:—

First operation (*Fig.* 3(*a*)). The table of the moulding machine is raised to press down the sand frame (3) to counter-pattern (2) fastened to sand-blower chamber (1). In its initial position, the patternplate (4) is lowered below the plane of the downsand frame (3), by a distance A. The moulding sand is blown into the space between pattern (5) and counter-pattern (2) through the holes in the plate.

Second operation (*Fig.* 3(*b*)). The table of the machine is lowered and a layer of moulding sand (6) remains on the pattern.

Third operation (*Fig.* 3(*c*)). The sand-blower chamber is moved aside and the flask (7) (with the perforations) is placed on the downsand frame (3). The shaped surface of the flask is not machined and, therefore, to avoid any destruction

FIG. 2.—*Microstructure of grey-iron discs (C 3.15, Si 2.4 and Mn 0.6 per cent.), 250-mm. dia., 15-mm. thick, depending on the thickness of the mould; (a) and (b), without sand facing (chill), (c) and (d) mould 5-mm. thick, (e) and (f) 15-mm. thick, (g) and (h) 40-mm. thick; (a), (c), (e) and (g) unetched, × 100, and (b), (d), (f) and (h) etched, × 300. Note: (b) and (d), thinnest section of facing sand—graphite in flake form with absence of cementite, and fine pearlite structure; (f) medium thickness of facing sand—coarse graphite and appearance of ferrite; (h) thickest section of facing sand—metal structure as for conventionally moulded casting.*



Thin-walled Moulds

of the sand layer, a small clearance is provided for between the latter and the flask.

Fourth operation (*Fig.* 3(*d*)). A cross-member (8) is arranged in the place of the sand-blower chamber and then the pattern unit is raised. After the flask has butted against the cross-member, the plunger (9) makes a

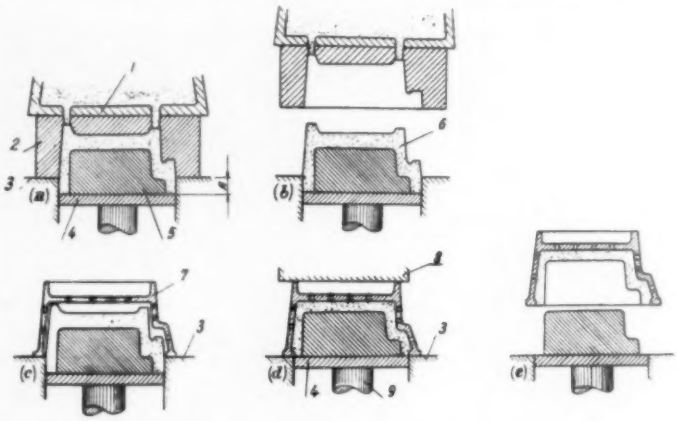


FIG. 3.—*Process of making thin-walled moulds having a support surface,* (1) *sand-blower chamber;* (2) *counter-pattern for blowing the sand mixture;* (3) *downsand frame;* (4) *patternplate;* (5) *pattern;* (6) *sand layer;* (7) *flask;* (8) *cross-member, and* (9) *machine ram.*

movement of magnitude A until the planes of the patternplate (4) and down-sand frame (3) coincide. At the same time, "differentiated" squeezing is effected, the characteristic feature of such squeezing lying in the fact that due to a specially-computed shape of the layer during one up-stroke of the plunger, the layers are compressed by *different* magnitudes, proportional to the vertical height of the layer in a finished mould. This method provides for an equal degree of compaction for layers

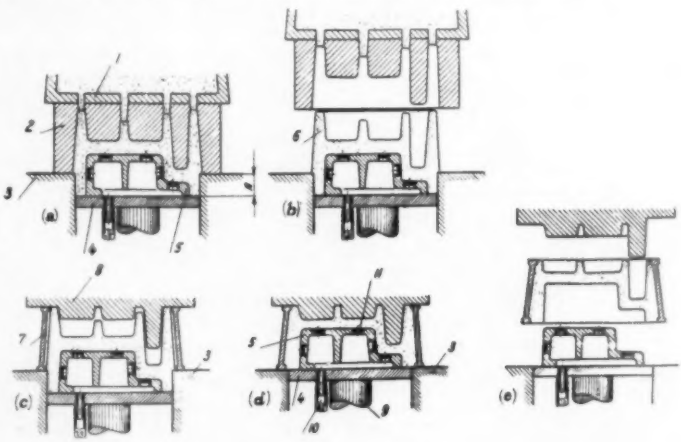


FIG. 4.—*Process of making thin-walled moulds with stiffening ribs instead of a support surface,* (1) *sand-blower chamber;* (2) *counter-pattern for blowing the sand mixture;* (3) *downsand frame;* (4) *patternplate;* (5) *pattern;* (6) *sand layer;* (7) *standard split frame;* (8) *pressureplate;* (9) *pressure plunger;* (10) *hose for feeding* CO_2, *and* (11) *vents.*

of different thicknesses. If necessary, it is possible to obtain easily some denser areas in a mould.

Fifth operation (*Fig.* 3(*e*)). The withdrawal of the pattern from the mould is carried out by a stripping mechanism if the green moulding sand possesses a sufficient strength, or by a turnover device if the green strength is insufficient. The subsequent operations of mould assembly, etc., do not differ from those generally in use.

Advantages

This method of moulding eliminates the shortcomings of the older process (Fig. 1). The counter-pattern (2) does not participate in pouring and therefore is continuously tightly adjoined to the plane of the downsand frame. There is no blowing-out of the sand-mixture; the flask is not used in the operation of blowing the sand in and, consequently, the requirements—so far as accuracy is concerned—remain the same as when moulding in conventional jolt or squeeze machines. To obtain accurate castings, the sand layer should rest tightly on the shaped wall of the flask, but it should be stressed, however, that the precision of the shaped surface of the flask may be considerably less, for instance, than that of a dryer which it resembles in appearance. It suffices for the shaped surface of the flask only to be fettled, since the close contact between the flask and the sand mixture is attained every time during squeezing.

With the new process, holes in the flask are

drilled directly in its walls and there is no need for bosses ((5) Fig. 1), a fact which helps in reducing weight. Lastly, no sand projections are formed in the mould from the blow slits or holes ((4) Fig. 1) which might result in "hot spots" during cooling of the casting. The costs of pattern equipment in the process under consideration are increased only by adding a new element, namely, a counter-pattern, but this is compensated by a smaller consumption of moulding materials and higher productivity from labour.

Second Variant

Moulding according to the second variant is carried out in the following sequence:

First operation, (*Fig.* 4(*a*)). Sodium-silicate bonded sand is blown from the sand-blower chamber (1) into the space between the counter-pattern (2) and the pattern (5). In this position, the patternplate (4) is lowered below downsand frame (3) by the squeeze stroke (A).

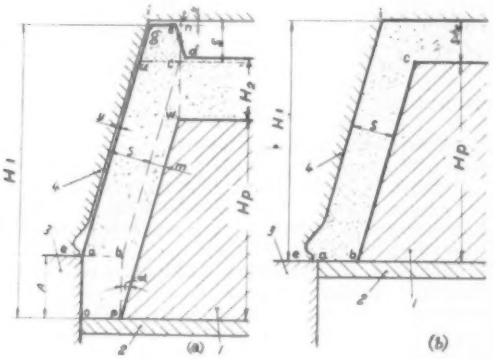


FIG. 5.—*Scheme for computing the preliminary shape of a compacted sand layer—*(*a*) *layer before squeezing, and* (*b*) *layer after squeezing;* (1) *pattern;* (2) *patternplate;* (3) *downsand frame, and* (4) *flask. (N.B. in* (*b*) *the dimension marked* H_1 *should be* h_1)

Second operation, (*Fig.* 4(*b*)). The layer of sand (6) is removed from the counter-pattern.

Third operation, (*Fig.* 4(*c*)). A universal split frame (7) is placed on the downsand frame (3) and the entire pattern unit is raised to the stop of the pressureplate (8). Attention should be paid to the fact that in this position the plate touches the upper layers of the mould and there is a clearance between it and the lower (thin) layers.

Fourth operation, (*Fig.* 4(*d*)). By means of the plunger (9), the patternplate (4) is raised to the level of the downsand frame (3), which performs the squeezing. In this position, the mould is gassed with CO_2 through vents (11) placed in the pattern (5). The gas is fed into the cavity of the pattern by means of a hose (10).

Fifth operation (*Fig.* 4(*e*)). After being gassed with CO_2, the mould is removed from the pattern. To produce high-quality castings, it is desirable next to place the mould into an oven for a short period. Frame (7) is used to facilitate transport operations and to close the halves of the moulds. After closing the mould, this frame is dismantled. In some instances, the frame was not used at all and in such cases, the wall ((7) Fig. 4 (c)) was made smooth and was bolted to the pressureplate (8). When no frame was used, the mould was removed from the downsand frame, transported and closed by means of a jig.

Squeezing

It follows from the description of the processes of preparing thin-walled moulds (see Figs. 3 and 4) that the compaction of the sand layer was mainly achieved by squeezing. Squeezing of thin-walled moulds is a special case of the more general problem aimed at obtaining uniform or controllable compaction of moulds by squeezing with a stiff pressureplate in the presence of high or "stepped" patterns in the flask. It may initially appear that performing of this task is facilitated by the uniform layer of the sand surrounding the pattern in thin-walled moulds, but in reality, the problem of uniformly ramming thin-walled moulds is more difficult, as the height of the layer changes in the *vertical* direction to a greater extent than in conventional moulds. At present, various methods have been suggested for moulding the preliminary layer to a required shape so that the desired compaction of moulding sand can be obtained with any required configuration of the pattern, as a result of subsequent "differential" squeezing. These principles are applicable for thin-walled moulds also. Considering one of the possible methods, Fig. 5 (*a*) shows the stage of moulding corresponding to the one shown in Figs. 3(*c*) or 4(*c*) and Fig. 5 (*b*) to the one in Figs. 3(*d*) or 4(*d*). The squeezing stroke (A) is computed for the highest layer with the least angle of inclination α. In the example given, the following is the initial equation postulated:

$$F_1 k + (F_2 + F_3 + F_4)(1 + k) = F_5 + F_6 \quad (1)$$

where, $k = \dfrac{H - h}{h}$ (2)

F_1 is the area of the cross-section of the sand layer limited by indices *abcng* $\left[F_1 = F_{abcu} + F_{ucng} = ab.Hp + (s - y)\ \dfrac{uc + gn}{2}\right]$;

F_2 is the area of the lateral clearance, bounded by indices *agie* ($F_2 = ea.h_1$);

F_3 is the area of the horizontal clearance limited by indices *gnti* ($F_3 = gn.y$);

F_4 is the area of the cross-section of the recess which holds the sand in the flask ($F_4 \approx 200$ to 300 sq. mm.);

F_5 is the area of the additional sand layer, limited by indices *abpo* ($F_5 = ab.A$);

F_6 is the area of the additional sand layer limited by indices *bcwp* ($F_6 = pw.m = pw.A$). $\sin \alpha$); and

k is the relative quantity of the moulding sand being rammed by squeezing (the ratio of the additional volume of the sand to the volume rammed).

Applying the values of the magnitudes into equation (1) and having solved it with regard to A, the following formula is obtained:

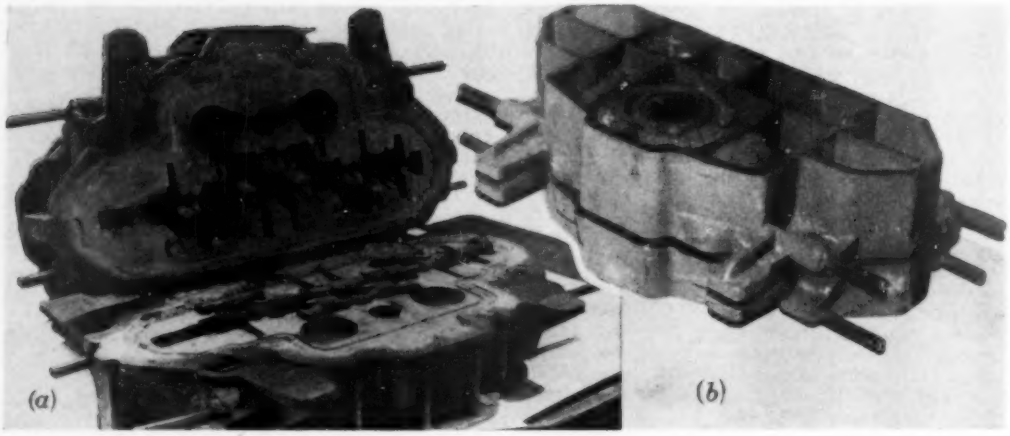


FIG. 6.—*Thin-walled mould for a crankshaft, made according to the scheme shown in Fig. 3, (a) mould shown open, with cores in place, and (b) closed mould assembly.*

$$A = \frac{F_1 k + (F_2 + F_3 + F_4) \cdot (1 + k)}{ab + pw \cdot \sin \alpha} \quad (3)$$

Example

An example (Fig. 5) of the practical application of this formula can be demonstrated in relation to Fig. 5. Here it is necessary to compute the squeezing stroke A and the height of the layers before squeezing H_1 and H_2, in conditions where:

$Hp = 200$ mm.; $\alpha = 3$ deg.; $S = 20$ mm.; $y = 2$ mm.; $F_4 = 250$ sq. mm., and $k = 0{\cdot}4$ (this magnitude provides for a green-strength of a conventional clay-sand moulding mixture amounting to about 0·4 to 0·5 kg. per sq. cm.) (5·7-7·0 lb. per sq. in.).

On computing the respective squares:

$$F_1 = ab.Hp + \frac{uc + gn}{2} (s - y);$$

$$ab = uc = \frac{s - y}{\cos \alpha} = \frac{20 - 2}{0{\cdot}9984} \approx 18 \text{ mm.}$$

$gn = ab - (s - y)\, tg\alpha = 18 - 18 . 0{\cdot}05241 \approx 17$ mm. (where α is in radians),

then:

$$F_1 = 18 \cdot 200 + \frac{18 + 17}{2} \cdot 18 = 3{,}894 \text{ sq. mm.}$$

$$F_2 = la \cdot h_1 = \frac{y}{\cos \alpha} \cdot h_1 = \frac{2}{0.9986} \cdot (Hp + s)$$

$$= \frac{2}{0.9986} \cdot 220 \approx 440 \text{ sq. mm.}$$

$F_3 = gn \cdot y = [ab - (s - y)\, tg\, \alpha] \cdot y = (18 - 18 \cdot 0{\cdot}05241) \cdot 2 = 34$ sq. mm.

$$pr = \frac{Hp}{\cos \alpha} = \frac{200}{0{\cdot}9986} \approx 200 \text{ sq. mm.}$$

Substituting the given values into the equation (2):

$$A = \frac{3{,}897 \cdot 0.7 + (770 + 37 + 250) \cdot 1.7}{18 + 200 \cdot 0.0523} = 91 \text{ mm.}$$

According to Fig. 5:

$H_1 = h_1 + A - y = 220 + 91 - 2 = 309$ mm.

Supposing that ramming of horizontal layers be the same as the vertical ones, then:

$H_2 = h_2 + kh_2 = s + ks = s(1 + k) = 20 \cdot 1.4 = 28$ mm.

Fig. 5(*a*) shows the shape of the sand layer at inclined and horizontal surfaces of the pattern built according to these data. At the initial moment before squeezing there is a clearance between the horizontal layer of sand and the wall of the flask, its magnitude amounting to A – kS. By computing all the cross-sections of the mould in this way, it is possible to obtain the shape of the preliminary layer and of counterpattern, 2 (Figs. 3 and 4).

Sand

Magnitude k, which defines the degree of compaction, is included in formula (3). Investigations were made of ten different compositions of sand mixtures, which were needed to establish the connection between k, the resulting density, and a required pressure of squeezing. As a rule, uniform ramming is aimed at, and a similar k is assumed when computing all the cross-sections of the given mould. If necessary, the process makes it possible, however, to set up at the same time a greater compaction of sand at areas of higher metal pressure.

A ciné film taken through a transparent wall traced the process of squeezing the layer of the type shown in Fig. 5. At first, when the patternplate is raised, the vertical walls are rammed and the clearance above the horizontal ones is reduced. At the end of squeezing, when the distance kS remains for the plunger to rise, the squeezing of the horizontal layer begins.

Crankshaft Mould

Data resulting from the investigations were used in designing the process of making thin-walled moulds

for casting the "Volga" engine crankshaft. The crankshaft is cast from nodular iron. Fig. 6 shows a thin-walled mould made according to the process shown in Fig. 3. A machine, fitted with devices for blowing, squeezing and drawing, is used for moulding. To improve the quality of the surface as well as the accuracy of the casting, a squeeze pressure of up to 20 kg. per sq. cm. was used. With intensive compaction, some sand mixtures exhibit a measure of elasticity and for this reason, distortion of the joint was recorded in some moulds after removal of the pattern and the bulge in the centre of the mould could be as much as 2 mm. This defect was eliminated by increasing the height of the preliminary layer on the edges and by reducing the height in the centre part.

When the sand is intensively compacted, care should also be taken to provide for the escape of gases generated in the course of pouring. This task is facilitated in the process described since the mould is of small thickness. To improve removal of gases, the flask is provided with a large number of holes. Cores were made according to the C-process; assembly and pouring were carried out as in normal practice. To prevent metal from getting between the ribs of the flask, a cast-iron weight in the form of a plate was placed on the top of the mould. Up to the present, the process has been worked out for the cssting of two shafts in a single flask.

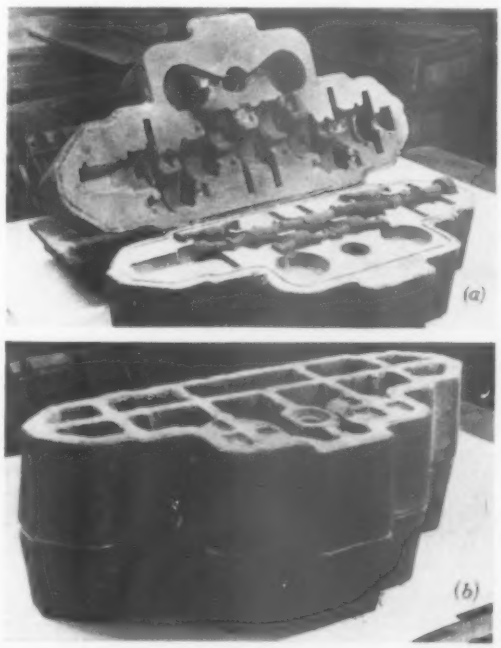
The crankshaft mould was made of a sodium-silicate sand according to the process illustrated in Fig. 4 and shown also in Fig. 7. The first variant of the process (Figs. 3 and 6) is economical when large quantities of similar parts are produced and where the use of special flasks is justified. It is believed that it is more economical to use flasks as supports than, for instance, the shot as used for shell moulds. For example, to fill up a shell forming two shafts, some 700 kg. of shot would be required and its transportation, separation and recovery of losses would involve considerable expenditure.

The second variant of the process (Figs. 4 and 7) is intended for batch-type production, when the first variant is not economical because of the necessity of providing for a large number of shaped flasks for each part manufactured. Economic calculations indicate that thin-walled moulds made of conventional sand mixtures are from eight to ten times cheaper than sand resin shell moulds, and labour conditions are also improved, owing to the absence of phenol in gases resulting at pouring time.

Conclusions

(1) As a result of long research, experiments and investigations, a highly-productive process has been developed for the making of thin-walled moulds. It is one which does not require any expensive binders and which guarantees precision and smoothness of the surface of castings. (2) The process of moulding is divided into two stages—a sand layer or shell is initially shaped by the blowing method at the first stage, and the final "differential" squeezing is effected at high pressure at the second. The appliances for blowing and squeezing are of different contour. Such a method of moulding makes it possible to obtain the desirable density of the layer at every cross-section with any shape of the pattern. (3) For mass-production, a process is recommended in which a shaped flask is used as a support for a thin sand layer. The shell may be green, surface-dried or dry sand. The precision of a dry thin-walled mould made in a flask, is greater than that of a core dried in a dryer, despite the fact that the shaped wall of the flask *is not machined*. Contact of the sand layer with the wall of the flask is attained by squeezing. (4) The microstructure of a grey-iron casting poured into a thin-walled sand mould with a metal wall is somewhat more dispersed and more compact than when the same metal is poured into a conventional mould, but there is no cementite in grey-iron castings even with a sand layer only 5 mm. thick. (5) For batch production, moulds provided with stiffening ribs are recommended, which impart the necessary structural strength without flasks. In this case, the mould should be of the dry-sand type and the CO_2 Process may be applied for this variant. (6) The high pressure used in the course of making thin-walled moulds improves the smoothness of the casting surface and increases precision of the castings, but it lowers the gas permeability of the sand. This feature is compensated for by the thinness of the shell of sand, which facilitates the escape of gases during pouring. (7) Economic advantage of the process lies

FIG. 7.—*Thin-walled mould for a crankshaft prepared according to the scheme shown in Fig. 4. (a) mould open, with cores in place, and (b) closed mould assembly.*



Thin-walled Moulds

in a reduced consumption of moulding materials, lower costs of the binders used and higher labour productivity.

Acknowledgments

The Authors wish to thank various persons and institutions for contributing to the successful fulfilment of the present work, in particular, Professor P. N. Aksyonov, doctor of technical sciences, chief of the "Department of Machines and Foundry Technology" of the Moscow Automechanical Institute, and A. S. Evseyev, V. L. Lesnitchenko and I. V. Titov, workers at the Research Technology Institute of the Automobile Industry.

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German Research Reports

The following have been abstracted from foundry sections amongst the *Forschungsberichte des Landes Nordrhein-Westfalen* (North Rhineland—Westphalia Research Reports) published by Westdeutscher Verlag, Ophovener Strasse 3, Opladen, Rhineland, Germany.

Relationship between Mechanical Properties of a Casting and Separately-cast Test-bar—*by Prof. Dr. W. Patterson and Dr. F. Iske (Aachen).*

(38 pp., 53 ill., 13 tables, Report No. 964 (1961).)

Evaluation of the mechanical properties in a grey-iron casting is based indirectly on the results obtained from a separately-cast test-bar. In order to establish correctly which test-bar diameter can be regarded as actually representing a certain casting, it is necessary to find a geometrical value which is common to both casting and test-bar and which characterizes their cooling conditions. It could be shown that the rate of cooling of simple test-pieces (round, square, rectangular bars, plates) and of quasi-real castings, can be defined with sufficient accuracy by the ratio

$$R = \frac{\text{surface}}{\text{volume}}.$$

The influence of the rate of cooling on the mechanical properties can thus be expressed from this ratio. The influence of varying chemical compositions on the mechanical properties in connection with the surface to volume ratio (R) has also been studied. A nomogram has been developed by the authors which will enable foundrymen to estimate in advance tensile strength and Brinell hardness, both in the test-bar and in the casting, when the degree of carbon saturation, S, (or the carbon equivalent, CE) and the surface to volume ratio, R, are known.

Passivation and Corrosion Resistance of Iron Alloys—*by Prof. Dr. A. Köniser (Düsseldorf).*

(26 pp., 7 ill., 8 tables, Report No. 968 (1961).)

The author carried out a large number of passivation experiments on iron alloys, particularly cast irons, taking into account their physical and chemical properties. The decisive advantages of using cast iron at places endangered by corrosion are demonstrated. After a short review dealing with the measurement of passivation phenomena, it is shown that, as a result of the formation of covering layers on cast irons, potentials of plus 0.9 v. against normal-hydrogen-electrodes can be achieved—bringing cast iron in line with the potential behaviour of precious metals. Nitric acid, of medium strength, was used for the chemical passivation and it was found that the presence of reduction products of the nitric acid (*e.g.* nitrous acid) is necessary for achieving passivation, and it was confirmed that white iron cannot be passivated—in line with the findings of previous investigators. Special experiments showed that iron/palladium alloys containing 0.05 per cent. Pd possess a passivation behaviour very similar to stable iron/carbon alloys. Of special importance is also the fact that the graphite content in cast iron positively influences the corrosion resistance, which fact could be established by experiments, using white cast iron and malleable cast iron.

Influence of Various Elements, both as Alloying Constituents and as Impurities, on the Viscosity Behaviour of Liquid Cast Iron—*by Prof. Dr. A. Köniser (Düsseldorf) and G. Kühl.*

(26 pp., 14 ill., 6 tables, Report No. 970 (1961).)

As a result of this investigation, the excellent fluidity of cast iron, so well known to every practical foundryman, can now be assessed. Whereas previous publications have dealt with the influence of individual alloying elements on the viscosity of high-carbon irons, the present paper deals with the interaction of the individual alloying elements in multiple-alloy systems. The author determined the viscosity of molten high-carbon irons of various compositions by using a rotary viscometer. Particular attention was paid to the influence of sulphur and phosphorus on the viscosity of alloys with high and low silicon contents. Increasing S and Si-contents increased the viscosity, phosphorus reduced it. Further series of experiments, using a normal casting spiral, were carried out, in order to establish the influence of phosphorus: (*a*) on the running length of the spiral as a function of temperature; (*b*) on the degree of mould-filling capacity, and (*c*) on surface tension. Fluidity values as such do not provide the foundryman with information on the important property of a cast metal to reproduce mould contours correctly. A diagram, plotting running length of the spiral against viscosity, for a "standard" cast iron containing Carbon 3, Si 2, Mn 0.33, and S 0.025 per cent. establishes a relationship between viscosity, running length, temperature and phosphorus content in a system with two variables.

Prizegiving at F. H. Lloyd & Company, Limited

The annual distribution of apprentice prize awards and certificates took place on November 29 in the works canteen of F. H. Lloyd & Company, Limited, James Bridge Steel Works, Wednesbury, when apprentices from the company, Lloyds (Burton), Limited, and Parker Foundry (1929), Limited, received their awards. An impressive array of prizes, including textbooks, drawing instruments, document cases, electric shavers, tools and "do-it-yourself" kits were presented, the total value being in excess of £2,000.

The meeting was presided over by Mr. D. B. Beynon, personnel manager, and was attended by executives from the three companies, together with parents of the apprentices, the company filling the whole of the large hall. In his opening remarks, Mr. Beynon, after welcoming the guests, said that in the past, the foundry industry had been a "Cinderella" industry from the point of view of higher technical qualifications, and he was very pleased to see the introduction in the National Foundry College of a Sandwich Diploma Course in foundry engineering. He said that the introduction of block-release courses at local technical colleges was another development which his company would have to consider in the light of their training commitments. Referring to the European Common Market, Mr. Beynon said the company were continuing language courses in French and German, started four years ago. Technical qualifications were not everything, he said, and there was more to education than simply chasing qualifications, and the ability to work hard, a sense of purpose and the will and ability to do a good job of work were equally, if not more, important.

Training of the young men present that evening was the joint responsibility of parents, colleges and the company Mr. Beynon said, and it was only with wholehearted co-operation that fully-trained young men of the future could be produced. He thanked all who had so enthusiastically assisted in training during the past 12 months and mentioned, in particular, Mr. E. J. Whitehouse, Mr. F. Naylor and his colleagues. Finally, Mr. Beynon dealt briefly with the changes in the company's apprentice training which had taken place during the year and the prospects for the future.

Training Officer's Report

In his report which followed, Mr. E. J. Whitehouse, group training officer, reviewed the past year, saying that it had been one of continued progress. The general standard set in the past had been maintained in all departments, the number of apprentices under training at Wednesbury being exactly 100. This figure, he said, was five more than a year ago and included one apprentice from Lloyds (Burton), Limited and one from E. C. & J. Keay, Limited. At Lloyds (Burton), Limited, there were 47 apprentices, an increase of one over last year, and at Parker Foundry (1929), Limited, there were 25, an increase of four. The total number of apprentices employed in the three companies was 172, against 162 a year ago.

Mr. Whitehouse said that during the 1960/61 technical college year, 73 apprentices at Wednesbury had taken advantage of the day-release facilities to pursue a course of technical study and of these, 48 (or 66 per cent.) were successful in their examinations. At Lloyds (Burton), Limited, 35 apprentices attended technical college on day release, and 14 from Parker Foundry. Mr. Whitehouse then detailed the successes of individual apprentices, and mentioned the Duke of Edinburgh's Commonwealth Technical Training Week which, he said, had been one of the "highlights" of 1961. Finally, he thanked the management of all three companies for their interest and guidance in all training problems during the past year and also thanked the members of the training department for their support.

Distribution of Awards

Mr. M. C. Lloyd, M.B.E. (joint managing director, F. H. Lloyd & Company, Limited) presented the awards to apprentices of the Wednesbury works, Mr. W. R. Cooper (assistant managing director, Lloyds (Burton), Limited) presented those to apprentices from his works, and Mr. F. Danks (director, Parker Foundry (1929), Limited) presented the awards to his young men. Apprentice (completion) certificates were presented to 19 young men from F. H. Lloyd, two from Parker Foundry and seven from Lloyds (Burton), and presentation of apprentice (commencement) agreements were handed over to nine young men of F. H. Lloyd, one of Lloyds (Burton) and seven of Parker Foundry. Works awards and those for part-time education successes were made to no fewer than 165 apprentices, 91 from F. H. Lloyd, 51 from Lloyds (Burton) and 23 from Parker Foundry. The "Sportsman of the Year Trophy" was presented by Mr. Lloyd to Mr. B. Franks, for all-round proficiency. Mr. J. N. Marriott (Lloyds (Burton), Limited) received an award from the Institute of British Foundrymen, handed over by Mr. Cooper, and a similar award also went to J. V. Hamnett (of F. H. Lloyd & Company) and this was presented by Mr. M. C. Lloyd. (These were presented for the excellent performance put up by both young men in the "knockout" competition, held prior to last year's International Apprentice Competition.) The Rosebowl Trophy (awarded annually in the inter-departmental sports competition) was again this year won by the "foundry" team.

Mr. H. M. Critchlow (of Lloyd's (Burton), Limited), spoke on behalf of all the apprentices who had received awards, and thanked the executives of the group and Mr. Whitehouse and the training department for their encouragement and help during the year.

Following the serving of refreshments, parents were given the opportunity to visit various departments and to discuss with staff of the training department the progress of their sons.

Britain falling behind in Technical Training?

Because of failure to provide sufficient university and technical training, Britain is steadily falling behind Russia and America in the field of education, Dr. J. Burns, president of the Institute of Fuel, said last week. He told members of the East Midland section of the Institute, at its annual dinner in Nottingham, that the Institute was helping to fill the gap by providing valuable training within the fuel industry. It was determining its own educational standards and supervising its own examinations.

Dr. Burns, who is deputy-chairman of the North Thames Gas Board, said that in London and the various regions, the Institute's technical meetings were performing a useful function by allowing students to discuss their work and gain valuable experience without having to go to university.

ALLIED IRONFOUNDERS, LIMITED—There has been a sharp fall in group profit for the first 28 weeks of the financial year and the interim dividend is reduced from 7½ to 5 per cent.

News in Brief

MAGCO, LIMITED, manufacturers of vibrators, vibrator conveyors, etc., has moved its London office to 132-135, Sloane Street, London, S.W.1 (telephone: SLOANE 9976).

AWARDS, PRESENTED by Mr. C. Cooke, principal of Rotherham Technical College, were received by 106 apprentices at Brown Bayley Steels, Limited, Sheffield, at the recent prize distribution.

THE ROYAL NETHERLANDS BLAST FURNACES & STEEL FACTORIES, LIMITED, of Ijmuiden, Holland, will shortly commemorate the start, 25 years ago, of the manufacture of cast-iron pipes.

BUTLER MACHINE TOOL COMPANY, LIMITED, Mile Thorn, Halifax, are planning to manufacture their machines under licence in India, and the Indian Government has sanctioned the proposal.

MR. JOHN C. MASTERS, northern area sales manager for the Univac computer division of Remington Rand, Limited, has moved to Manchester to begin organization of the Univac computer centre there.

THE ENGINEER'S TOOLS DEPARTMENT of George Cohen Sons & Company, Limited, moved to the company's new machine-tool headquarters at 23-25, Sunbeam Road, London, N.W.10, last week. The telephone number is ELGAR 7222.

ON BEHALF OF the Owen Organization, Sir Alfred Owen has signed an agreement with V/O Machinoexport of Moscow for the distribution of a wide range of Soviet welding equipment in most countries of the Commonwealth and the USA.

AIRCRAFT, pleasure boats, automobiles, motorcycles, airlines, shipping and freight, will be represented at the second Melbourne International Trade Fair which will take place from February 27 to March 16, 1963. There will also be ironware and machinery.

LARGE SHIPMENT of refractory materials for export to New Zealand by General Refractories, Limited, Sheffield, has been despatched from works in the Genefax group. Some 850 tons of refractories, destined for the largest plant of its kind in New Zealand, are involved.

IN THE THREE MONTHS since it was announced that bookings were being accepted for exhibitors at the planned new headquarters of the Engineering and Building Centre, Birmingham, more than 320 firms have reserved space, the advance bookings accounting for more than a half of the 600 exhibition stands available.

FOLLOWING THE recent acquisition of certain of the interests of the Pulsometer Engineering Company, Limited, Reading, by G. & J. Weir Holdings, Limited, the products of Joseph Evans & Sons (Wolverhampton), Limited, are now being marketed by G. & J. Weir, Limited—principal manufacturing subsidiary of the Weir group.

AN ORDER has been received from Cuba by Suffolk Iron Foundry (1920), Limited, a member of the Qualcast group of companies, for oxy-acetylene equipment, including welding and cutting blow-pipes and spares. Worth £7,000, this is the second order received by this company from Cuba for their equipment since the summer; it is being shipped this month.

MONMOUTHSHIRE Federation of Trades & Labour Councils is to approach Richard Thomas & Baldwins, Limited, to seek its views on the setting up of a small airfield in the county. The Federation considers that an airfield would be a great aid to industrialists, and is anxious for the leading firms in the county, with the co-operation of the county council, to build one.

AN AGREEMENT has been reached between the F. J. Stokes Corporation, of Philadelphia, and Vacuum Industrial Applications, Limited, high vacuum pump manufacturers, of Wishaw (Lanarkshire), a member of the Lithgow Group, which will give the Scottish company the right to produce Stokes vacuum-induction furnaces and stream-degassing equipment, principally for the steel industry.

AMOUNTING TO OVER 60 per cent. of its total production, exports of the Colchester Lathe Company, Limited, a member of the George Cohen 600 Group, Limited, have reached a record figure. Annual output is in excess of 3,500 machines, and extensions to the firm's Colchester factory, when complete, will substantially increase this amount. The additional output will be allocated mainly to export.

EFCO FURNACES, LIMITED, Weybridge, Surrey, has received orders valued at over £100,000 for heat-treatment equipment to be installed in the new Rootes factory at Linwood, near Paisley, Scotland, where the new small Hillman car is to be produced. In addition, the company has received orders for furnaces for the treatment of aluminium die-cast components to be produced by Rootes in their die-casting factory also being built at Linwood.

THE WATERSIDE WORKS of Ransomes & Rapier, Limited, have been visited by two members of the Polish delegation of senior engineers which has been in this country. They were Mr. Leon Kolarski, of the Foreign Trade Polinnex—the Polish national buying organization, and Mr. Stefan Oldakowski, an expert on contractors' plant. They were accompanied by Mr. R. J. Dunnett, assistant export manager of the firm, and Mr. A. W. Hunt, assistant home sales manager.

IN THE ELEVEN months ended November 30, a record number of 66,202 Fordson tractors were produced at the Dagenham (Essex) factory of the Ford Motor Company, Limited, and in the 10 months to October 31, 1961, total sales exceeded last year's record for the same period. While exports of tractors to Europe have increased, total export sales to the world market have shown a fall of 2.4 per cent. Since production began at Dagenham in 1933, well over 500,000 tractors have been exported.

MONTREAL, Canada's largest city with a population of 2,059,000 (as at September 1, 1961) has received final approval to proceed with its first subway, nearly a century since London built its first underground steam railway in 1863. Montreal's Underground will be about 14.7 miles long and is expected to cost between £93,000,000 and £104,000,000, taking four years to build. In comparison London has more than 85 miles of underground railway, including the world's longest tube tunnel, 17¼ miles long.

ANOTHER cut in the price of titanium is announced by Jessop-Saville, Limited, of Sheffield, the BSA Steel Division. This means that in six years the price of this metal has been cut by more than half. The latest reduction is approximately 10 to 15 per cent. on most titanium products and will take effect about the end of the year. "Increasing output and further improvements in production techniques are reducing our costs," said Mr. J. F. Wallace, sales director, "and we are passing these savings on to the consumers."

IF SOME SENSIBLE BALANCE was not achieved between wages and productivity, the employment and living standards of the British people might be imperilled, said Mr. Alexander Robertson, managing director of

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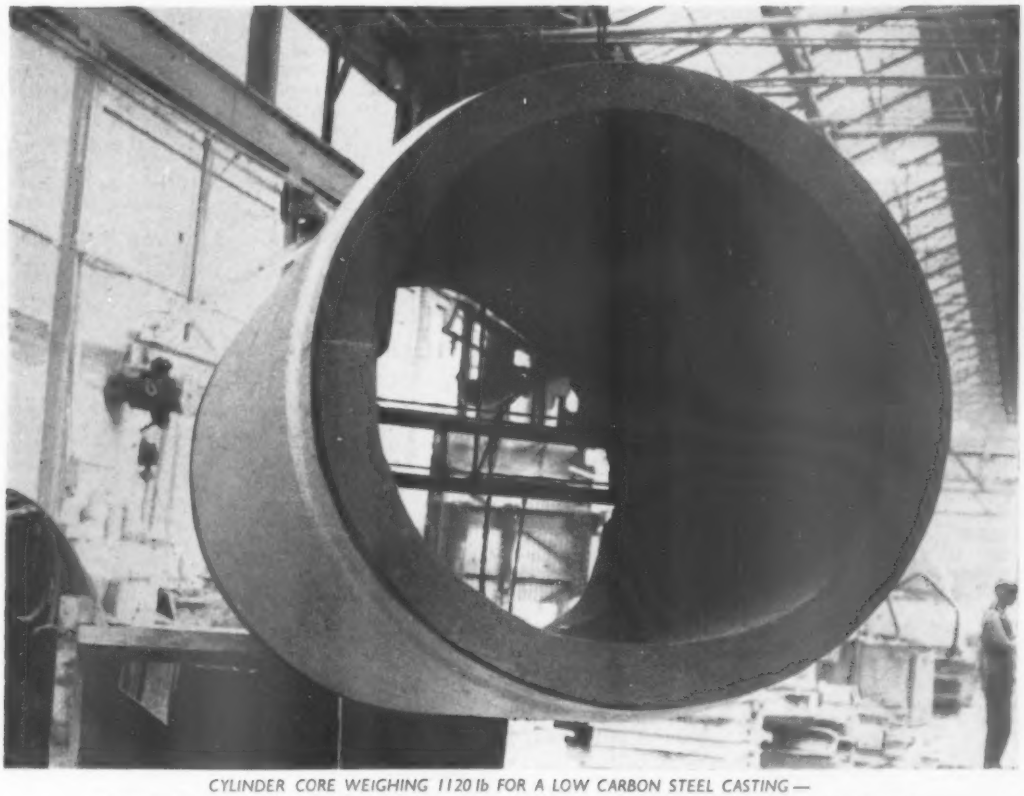

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PROMPT DELIVERIES FROM STOCKS IN: NEWCASTLE UPON TYNE, SHEFFIELD, MANCHESTER, BIRMINGHAM AND LONDON

News in Brief

Glenfied & Kennedy, Limited, Kilmarnock, at the Glasgow district dinner of the Foremen & Staff Mutual Benefit Society. Speaking of his own company, he said following the introduction of the 42-hour week, a national wage award, and "inevitable internal adjustments which seem to go on all the time," their labour cost in January last was 10 per cent. above that of a year ago.

THE "MACHEVO" TRADE FAIR in Utrecht, Holland, will take place from November 21 to 28, 1962. It is a specialized trade-fair for manufacturers, importers and distributors of industrial machinery and apparatus, laboratory instruments and supplies for the manufacturing, conditioning, processing and packaging industries in the food and luxury goods, dairy, chemical and pharmaceutical sectors. This fair was originally a biennial event but is now held in Utrecht every three years, attracting great interest both at home and abroad. Over 500 firms from Western Europe (including Holland) and the USA will exhibit goods next year.

GLOUCESTER RAILWAY CARRIAGE & WAGON COMPANY, LIMITED—In a further letter to shareholders, the chairman, General Sir William Morgan, says that the board emphatically disagrees with much of the comment by Mr. Scammell, the stockholder who criticized the terms of the offer made by Winget, Limited, Winget will not increase its offer and no other is forthcoming. As to liquidation, Sir William says the outcome would not be more advantageous as repayment of capital would be subject to costs and there would be no income in the interim period. The sale of the business as a going concern would involve further trading losses until a sale was effected, which might take some time. Support actually notified for rejection of the Winget bid now exceeds 30 per cent.

THERE WAS AN INCREASE in the Tees exports, but still room for "a very great deal of improvement," said Alderman A. Ross, deputy chairman of the Tees Conservancy Commissioners, in Middlesbrough on December 4, when he presented the annual trade figures for the year ended October 31. He reported that during the year there were 3,732 ship clearances, a decrease of 338 on the previous year. Imports at 5,421,351 tons were 783,254 tons less than the previous year. The decrease was accounted for mainly by iron ore, coal and scrap. Exports totalled 1,549,153 tons, an increase of 12,735. There was an increase in exports of slag which had more than offset a fall in iron and steel manufactures and sulphate of ammonia. The Commissioners' revenue at £621,641 for the year, was a decrease of £36,802.

Board Changes

GLOVER & MAIN, LIMITED—Mr. V. Stott, managing director of Jas. Stott & Company (Engineers), Limited, a member of the group, has been elected to the board.

GRIFFIN & GEORGE (SALES), LIMITED—Mr. Martin Lyth has been appointed director of supplies. He was formerly managing director of the subsidiary, Griffin & George (Scientific Instruments), Limited.

BRITISH THERMOSTAT COMPANY, LIMITED—Mr. Robert Broadbent has joined the board of the company, the parent of the Teddington group, as executive director. He has also been appointed chairman of Teddington Autocontrols, Limited, Teddington Controls (Exports), Limited, and P. W. Baker & Sons, Limited, and has joined the board of Teddington Aircraft Controls, Limited. Mr. C. S. Gardner, managing director of Teddington Aircraft Controls and Mr. R. H. Seward, managing director of Teddington Autocontrols have also joined the board of the parent company.

Common Market will jolt UK Traditions

Speaking to the Royal Society of Arts in London on Monday, Mr. Roger Falk, a director of Production-Engineering, Limited, said: "The Common Market will provide the biggest jolt yet to British industry. Let us hope that both management and labour, in their present myopic mood, will respond."

Mr. Falk, who is chairman of the Marketing Development Company, Limited, and the British Export Trade Research Organisation (1952), Limited, went on: "We are desperatedly slow to receive and accept new ideas, and seem rooted in tradition, and while so much of that tradition is good and has been tested by the exacting claims of time and experience, we take an age to cast off that which is bad, or, if not bad, at least anachronistic and outmoded." He suggested that the most serious attitude of all was that we somehow ought to be getting more than we give.

Regarding exports, Mr. Falk remarked that it is not the fun that had been suggested. "It is not easy, and not immediately rewarding," he said. "It calls for immense energy, a strong will and a good deal of faith."

Mr. Falk listed five features for any export effort by a company:—Sound market research; good design; economic and effective channels of distribution; after-sales service, and skilful promotion.

Higher Costs force down United Steel's Profits

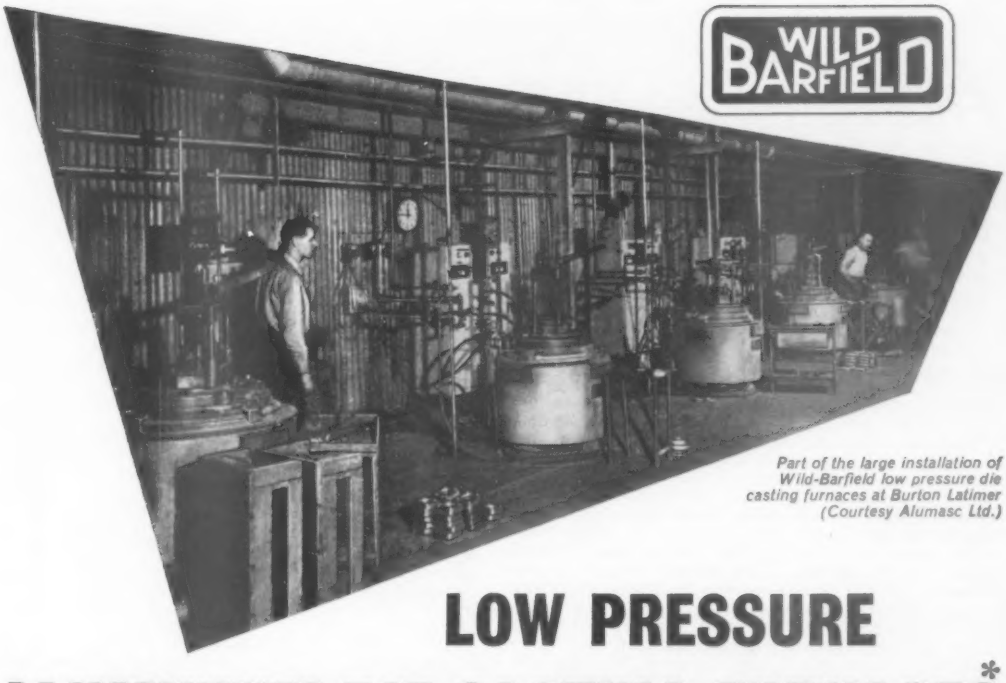
Lower group profits are announced by the United Steel Companies, Limited, for the year ended September 30, 1961, but the final dividend is maintained at the forecast rate of 7½ per cent. on £50,000,000. The year's total is equivalent to 12.3 per cent., allowing only for a one-for-four scrip issue made after the interim dividend. Previously 18 per cent. was paid on £30,000,000—prior to either issue—equal to 14.4 per cent., taking the scrip issue into consideration. After a heavier depreciation provision, the trading surplus is £16,810,000 against £22,920,000. The total surplus, after crediting (debiting) non-recurring and extraneous items, is £17,270,000 compared with £22,580,000.

The directors state that the main reason for the reduction of £5,307,000 in the total surplus was the increased costs which were in force throughout the year and for which little compensation was received from inadequate price increases, which covered only a small part of the year. The secondary reason was the reduction in operating rates, due to market conditions, which materially affected only the last quarter of the year.

Underground Gas Storage

Plans to store gas underground in an area of about 3,500 acres in and around Chilcomb, near Winchester (Hants), are being prepared by the Gas Council, which is promoting a private bill in Parliament to authorize this, with the consent of the Ministry of Power. If the scheme is approved, the industry will store gas during the summer, when demand is low, for use during the peak demand periods in the winter.

Chairman of the Gas Council, Sir Henry Jones, has invited land owners and other interested parties to a meeting in the Guildhall, Winchester, when the scheme will be further explained.



Part of the large installation of Wild-Barfield low pressure die casting furnaces at Burton Latimer (Courtesy Alumasc Ltd.)

LOW PRESSURE ALUMINIUM DIE CASTING FURNACES*

(Mains Frequency Induction Heated)

Simple to service
No elements to burn out
No channels to clean
No metal contamination
Accurate temperature control

Over 30 furnaces supplied to one well-known American Motor Manufacturer and currently used for production of Aluminium engine castings

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WB.113

Raw Material Markets

Iron and Steel

Although less than three quarters of existing blast furnaces are now in production, and a number of these are working below capacity levels, outputs of all grades of pig-iron are more than adequate to satisfy consumers' requirements. Apart from the fairly heavy stocks at some furnaces, current demands are not absorbing outputs fully. Basic pig-iron, which comprises about 75 per cent. of overall outputs, is being supplied on a much reduced scale to steelworks but the fairly substantial consignments which have been shipped overseas have enabled some suppliers to maintain production and relieve their stock position.

All grades of foundry pig-iron continue plentiful and most makers could step up deliveries appreciably if needed. The easy supply position, coupled with the scarcity and uncertainty of forward business, is restricting deliveries of pig-iron to cover only supplies needed by the foundries for current consumption and a sufficient stock to ensure uninterrupted production.

Variable demands continue to be made on the engineering and speciality foundries for high-duty castings, but overall there is little change in their trading position. From some sections of the motor vehicle industry there have been indications of a further decline in demands for castings, while from others some improvement has been evident from a bigger call for pig-iron. The machine tool trade continues to specify good tonnages of castings but there appears to be some easement in their recent usage. The engineering trades continue to utilize reasonably good quantities of castings and although from collieries, steelworks, railways, and other consumers demands remain moderate, overall requirements of castings enable the engineering and speciality foundries to obtain reasonably good outputs.

The light foundries producing castings for the domestic utensil trade maintain their improved outputs, which result from seasonal influences, and this should continue during the autumn and winter periods at least. The call for castings from the building trades is fairly good but lower than recent bookings. The light, jobbing, and textile foundries are all in need of more work, and the malleable iron foundries are also finding it more difficult to secure business. The foundries are well provided with most of their scrap requirements and no difficulty is experienced in obtaining supplies of foundry coke, ganister, limestone, and firebricks.

The re-rollers continue to find it increasingly difficult to obtain orders. Although many are working a reduced number of shifts, the orders now arising for small bars, light sections, and strip are insufficient to make up rolling programmes and this involves numerous roll changes. Reinforcing rods continue in fairly good demand, but below previous levels.

Home steelworks are unable to obtain sufficient orders to absorb the steel semis which could be made available for the re-rollers. The call for supplies of mild steel billets, etc., has shrunk to very low levels, and many steelworks are now finding it more difficult to dispose of their arisings of defectives and crops. Carbon and alloy steels are also more freely available, due mainly to the reduced requirements of the motor vehicle industry.

Non-ferrous Metals

The outbreak of bitter fighting trouble in Katanga has done nothing more than keep copper prices firm in London; nor indeed has the report that the Soviet Government has sent a delegation to Chile with a view to a purchase of the equivalent of more than half Chile's normal annual copper production. The general feeling is that the LME price of copper will remain at its present level for the remainder of this year, namely, around £228-£230 a ton. The US price of 31 cents a pound is still applicable for both custom smelters and producers.

Tin is also an unenthusiastic market on both sides of the Atlantic. Supplies, it is felt, are sufficient to meet any foreseeable demand and consumer interest is best described as routine. Taking a longer term view, there are many who still believe it to be bullish. If demand picks up there is some substance to this view as with prices at their present level there is not the same fear that the US Government would release tin from the strategic stockpile. This is because such a move would definitely depress market prices and this is contrary to its expressed policy.

From Djakarta, the Indonesian Government reports increasing trade with the Eastern block and that this has already resulted in 500 tons of tin being sold to Russia. Moreover, the Government has said that between 500 and 2,000 tons will be shipped to the same destination next year and also another 1,000 tons to an unspecified Eastern European country. While doubts have been expressed that Indonesia will be able to fulfil these and other orders, the bull point for the market is that it may mean that the USSR will not be offering tin on the London market next year. The LME price is fluctuating widely around £953 a ton with a contango varying between £10 and £11 a ton. In the US the market is quiet and the quotation below $1.22 a pound.

Lead in London continues to be a quiet and uninspiring market with the price hovering around £60 a ton. In the US demand is quietly steady with the quotation unchanged at 10¼ cents a pound. Zinc is a fairly good market in terms of demand in the United States and on the Continent. In London it is without feature and the price is finding it hard to keep above £70 a ton. In the US the quotation is unaltered at 12 cents a pound.

House Organs

Wiggin Nickel Alloys, No. 62. Issued by Henry Wiggin & Company, Limited, Thomas House, Millbank, London, S.W.1.

The emphasis in this edition of the magazine is on applications of high-nickel alloys to high-temperature materials, specifically in the gas-turbine engine. The four main articles cover development of a small-gas turbine for industrial use by the British Motor Corporation, Limited; progress made by HSBT-Clark with an order for four industrial gas-turbines for the new trans-Syrian pipeline of the Iraq Petroleum Company; a small gas-turbine developed by Rover Gas-Turbines, Limited, for light aircraft, and applications of heat-resisting alloys in five Bristol Siddeley engines.

Close-up. No. 23. Published by Armstrong-Whitworth (Metal Industries), Limited, Close Works, Gateshead-on-Tyne.

This issue carries a success story of s.-g. cast iron. Tundish castings weighing 3 and 3¾ cwt. have been supplied by the company to the Delta Metal Company, Limited, of London. They are used for handling non-ferrous metal from two main-frequency induction furnaces and are reported to have a life of nine months compared with up to three weeks when using other cast-irons.

Photo by courtesy of Fibres Division, Imperial Chemical Industries Ltd. Manufacturers of 'Terylene' polyester fibre.

C IS FOR CONVEYOR BELTS at a new I.C.I. plant in Cheshire, where eight Goodyear belts of rubber and 'Terylene' carry coke, burnt lime and coke/lime mixture. 'Terylene' was chosen for its flexibility and strength, which allows exceptionally deep troughing so that deck plates, skirt boards, etc., are eliminated and idlers can be spaced 50% wider apart. 'Terylene' also withstands the heat of the coke (carried at up to 120°C), is rotproof and resists moisture penetration. For the *right* conveyor belt, installed in the *right* way and maintained in the *right* manner, contact Goodyear Industrial Products Division at Wolverhampton.

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Basis prices, delivered unless otherwise stated. Prices following side headings marked* are subject to an increase of 1 per cent. under Iron and Steel Board Price Determination, 1961, No. 2.)

December 12, 1961

PIG-IRON

* **Foundry Iron.**—No. 3 IRON, CLASS 2, 10-ton lots or over, Middlesbrough, £21 17s. 0d.; Birmingham, £21 9s. 3d.

* **Low-phosphorus Iron.**—Over 0.10 to 0.40 per cent. P, 10-ton lots or over, £23 5s. 0d., delivered Birmingham; £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

* **Hematite.**—Si less than 2 per cent, S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over: N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 9s. 0d.; Birmingham, £25 13s. 0d.; South Wales (Welsh iron), £23 19s. 0d.

* **Basic Pig-iron.**—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(*per ton unless otherwise stated, delivered*)

Ferro-Silicon (6-ton lots and over).—45 per cent. Si, £45 0s. 0d. to £48 0s. 0d., scale 15s. 0d. per unit, lumpy, 75 per cent. Si, £62 10s. 0d. to £66 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 14s.1d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 9s. 1d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 12s. 1d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £80 10s. 0d. to £84 10s. 0d., basis 60 per cent. Cr scale 27s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £79 0s. 0d. to £82 10s. 0d., basis 60 per cent. Cr, scale, 27s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr.; 0.10 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 1s. 10½d. to 2s. 1d. per lb. Cr. * Average 68-70 per cent.

Metallic Chromium.—98/99 per cent., 6s. 9d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £275 0s. 0d.; 96/98 per cent., £285 0s. 0d.

Ferro-columbium.—65/67 per cent. Cb + Ta, 19s. 0d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £58 10s. 0d.

SEMI-FINISHED STEEL

* **Re-rolling Billets, Blooms, and Slabs.**—BASIC: Soft u.t., 100 tons and over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 100 tons and over, £32 5s. 6d.; hard (0.41 to 0.60 per cent. C), 50 tons and over, £33 17s. 0d.; silico-manganese, 50 tons and over, £42 16s. 6d.; free-cutting, 50 tons and over, £35 4s. 6d. SIEMENS MARTIN ACID (50 tons and over): Up 0.25 per cent. C; £40 11s. 0d.; silico-manganese, £43 4s. 0

* **Billets, Blooms, and Slabs for Forging and for Stamping** 50 tons and over).—BASIC: Soft, up to 0.33 per cent. C, £37 0s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £38 2s. 6d.; acid, up to 0.25 per cent. C, £41 14s. 0d.

FINISHED STEEL

* **Heavy Plates and Sections** (50 tons and over).—Ship plate (N.-E. Coast), £40 7s. 0d.; boiler plates (N.-E. Coast), £42 17s. 0d.; floor plates (N.-E. Coast), £41 16s. 0d.; angles (N.-E. Coast), £38 1s. 6d.; joists (N.-E. Coast), £37 17s. 6d.

* **Small Bars, Sheets, etc.**—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 6d.; under 4 tons to 2 tons, £41 3s. 6d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 4s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £67 16s. 0d.; nickel-chrome, £100 18s. 0d.; nickel-chrome-molybdenum, £113 11s. 0d., in lots of 25 tons and over.

NON-FERROUS METALS

Copper.—Cash, £232 15s. 0d. to £233 5s. 0d.; three months, £233 0s. 0d. to £233 5s. 0d.; settlement, £233 5s. 0d.

Copper, Tubes, etc.—Solid-drawn tubes, 2s. 2½d. per lb. rods, 243s. 6d. per cwt. basis; 20 s.w.g., 278s. 6d. per cwt.

Tin.—Cash, £952 0s. 0d. to £954 0s. 0d.; three months £964 0s. 0d. to £965 0s. 0d.; settlement, £954 0s. 0d.

Lead (Refined Pig).— First half December, £60 15s. 0d. to £60 17s. 6d.; first half March £61 17s. 6d. to £62 0s. 0d. settlement, £60 17s. 6d.

Zinc.—First half December, £71 7s. 6d. to £71 12s. 6d., first half March, £72 7s. 6d. to £72 10s. 0d.; settlement; £71 12s. 6d.

Zinc Sheets etc.—Sheets, 15g. and thicker, all English destinations, £108 12s. 6d., rolled zinc (boiler plates), all English destinations, £106 7s. 6d.; zinc oxide (Red Seal); d/d buyers' premises, £85 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes 1s. 9½d. per lb.; sheets to 10 w.g., 195s. 6d. per cwt.; wire, 2s. 8½d.; rolled metal, 195s. 6d. per cwt.

Brass (Brazing).—BS1400, SCB2, £179; SCB3, £175.

Brass (High Tensile).—BS1400, HTB1, £197; HTB2 £214; HTB3, £229.

Gunmetal.—BS1400, LG2, £213; LG3, £223; G1, 1½% £283; G1 ½% £299.

Phosphor Bronze.—BS1400, PB1 (AID released), £316; PB4 £302; BS1400, 90/10/1%, £303.

Leaded Phosphor Bronze.—BS1400, LPB1, £238.

Phosphor Bronze Strip, etc.—Strip, 300s. 3d. per cwt.; wire, 4s. 2d. per lb.; rods, 3s. 4½d.; tubes, 3s. 4½d.; chill cast bars, solids 3s. 5d.; cored, 3s. 6d. (CHARLES CLIFFORD LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 11½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 4½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 3½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 2½d. to 2s. 3d. per lb.; Antimony, English, 99 per cent., £230 0s. 0d. Quicksilver, ex-warehouse, £59 0s. 0d. Nickel, £660 0s. 0d. Aluminium, ingots, £186 0s. 0d.; aluminium bronze (BS1400), AB1, £238 AB2, £245.

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Personal

MR. V. W. SLATER has retired as a director of Laporte Industries, Limited, after 41 years with the group.

MR. A. O. COX has been appointed to the board of Bairds & Scottish Steel, Limited, and is now commercial director.

MR. ARNOLD CARR, deputy chairman and assistant managing director of Thos. W. Ward, Limited, has been appointed joint managing director of the company.

MR. ANTONY VICKERS, a founder of Fluidrive Engineering Company, Limited, will, as from January 1, continue to serve the board but as a non-executive director.

MR. F. BOYD, general manager of George Blair and Company, Limited, ironfounders, has been appointed general manager of the Wigan works of Metaducts, Limited.

MR. L. DAVIES has been appointed a director of Pulsometer Engineering Company, Limited, Nine Elms Iron Works, Reading, and has assumed the title and responsibilities of works director.

MR. G. D. SPARROW, general manager of the mechanical and works engineering departments, Thorn Electrical Industries, Limited, has been appointed to the board of Atlas Lighting, Limited.

MR. E. R. HENSCHKER and MR. R. M. L. ELKAN have been appointed directors of the Loewy Engineering Company, Limited, a member of the engineering division of Tube Investments, Limited.

LORD RIVERDALE presented awards to members of the sports club of Arthur Balfour & Company, Limited, Sheffield, at their tenth annual meeting at their club room at Whirlow Park on November 30.

MR. T. O. HUNT, managing director of Specialloid, Limited, piston manufacturers, Airedale Works, Leeds, has been elected chairman in succession to Mr. D. I. BALL, M.B.E., who has retired from the board.

MR. OSWALD BERTRAM DAVIES, formerly technical director of S. S. Stott, Limited, Laneside Foundry, Haslingden (Lancs), who died on September 12, aged 81, left £11,465 gross, £11,347 net. (Duty paid, £681.)

MR. REGINALD CUTLER, chief accountant of Brookhurst Igranic, Limited, a company in the Metal Industries group, has been given the additional appointment of company secretary following the resignation of MR. NORMAN CLARK.

MR. J. GREGORY, managing director, General Refractories, Limited, Sheffield, presented gold watches to five employees in recognition of the completion of 25 years' service with the firm, at the annual dinner and dance at Stocksbridge Victory Club Hall on December 3.

MR. P. J. STEVENS, who for 25 years has been managing director of the Stamford Engineering Company, Limited (a subsidiary of Tipper Industries, Limited, Birmingham), has terminated his contract and will concentrate on the control of Carter Bros. (Billingshurst), Limited, Sussex.

MR. R. D. G. SNOW, a former president of the Machine Tool Trades' Association, presented nine students with awards worth 25 guineas in Manchester on December 1. They were in respect of a course of post-graduate standard in advanced tool-design at Manchester University, sponsored by the Association.

MR. E. NICHOLAS HALL, chairman of Hall & Pickles, Limited, Ecclesfield, Sheffield, presented gold watches to 15 employees who had completed 25 years' service with the company on December 1. He was accompanied by Mr. F. R. ROBBINS, managing director, and Mr. A. M. C. MURPHY presided. 145 employees of the firm have now received gold watches for 25 years' continuous service.

Obituary

PROFESSOR HUSBAND

Professor Joseph Husband, Emeritus-Professor of Civil Engineering at Sheffield University, died in a Sheffield nursing home on December 4 at the age of 90. He was educated at Sheffield Central School, won a Royal Exhibition there in 1888, and went on to the Royal College of Science connected with Dublin University and gained first place in the final examinations in 1891.

After work as assistant surveyor at Londonderry, Ulster, where he was engaged on bridge work, he returned to Sheffield in 1892 to inaugurate the Civil Engineering Department of Sheffield Technical School, which became Sheffield University College, and then the University. He was appointed the first Professor of Civil Engineering at Sheffield University in 1921 and held the post until 1936, when he was appointed Emeritus-Professor. He became senior partner of the firm of consulting engineers, now practising in Sheffield, London and Colombo, as Husband & Company. Professor Husband was a member of the Institute of Civil Engineers for 64 years and of the French Society of Civil Engineers for 58 years, president of the Institution of Structural Engineers in 1937, and an honorary member of the American Society of Civil Engineers.

The death is announced of Mr. N. FINCH, the Leeds area manager of Crofts (Engineers), Limited, of Bradford, Yorkshire. Mr. Finch, who was 41 years old, joined Crofts 12 years ago as a technical sales engineer in the Sheffield area and has been the manager of the Leeds office since January 1958.

MR. W. G. FORREST, chief estimator for Lithgows, Limited, shipbuilders, Port Glasgow, died on December 1 at his home, 4, Campbell Street, Greenock, at the age of 61. He had been 46 years with the firm, joining them as an apprentice draughtsman. Later he became an estimator and for the past 14 years had been chief estimator.

Mr. WILLIAM HENRY SQUIRE, of 38, Norman Road, Northfield, Birmingham, who was personnel manager at the Austin Factory, Longbridge, from 1918 until 1955, has died aged 79. Mr. Squire commenced his career with the Brush Electrical Company, Loughborough in 1903 and joined the Austin company as official photographer 10 years after. Later he became assistant personnel manager. Although he retired as personnel manager in 1955 he remained at Longbridge to carry out various administrative duties.

Darwins Group, Limited, announce the death on December 1 of MR. FRANK THOMPSON-SCHWAB, chairman of the Group and of Balfour & Darwins, Limited. A London stockbroker, Mr. Thompson-Schwab, who was 70, not only engineered the expansion of Darwins, but was also co-architect, with Lord Riverdale, of the merger joining Darwins to Arthur Balfour & Company, Limited. He became chairman of the holding company, Balfour & Darwins, Limited, with Lord Riverdale, as deputy chairman. Mr. Thompson-Schwab was a Freeman of the City of London, a Liveryman of the Worshipful Company of Farmers and a Freeman of the Cutlers' Company. He was educated at Clifton College and served in World War I as a Major in the Royal Artillery.

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AP157

Company News

Thos. Firth & John Brown Profits

Consolidated profits of Thomas Firth & John Brown, Limited, which specializes in the manufacture of special and stainless steels, was little changed for the year ended September 30, 1961, at £4,425,251 against £4,490,740, after charging £869,752 (£733,642) for depreciation, and debenture interest of £125,167 (£129,543), and crediting investment income and other interest. A balance of £1,915,421 (£1,811,331) remains after deducting tax and allocating £537,000 (£625,000) to capital reserves, representing additional depreciation towards the increased cost of replacing fixed assets. Final dividend is declared at 7½ per cent. making an unchanged total of 12½ per cent.

Imperial Chemical Industries of Australia & New Zealand, Limited—Consolidated profits fell to £A2,135,000 (£A3,082,000) for the year to September 30, 1961, and with a final of 4 per cent. the total ordinary dividend is held at the previous year's equivalent of 7 per cent.

Foundry Equipment & L. & Y. Holdings, Limited—There was a group net loss for the year ended March 31, 1961, of £39,367 (£18,351 profit) and no ordinary dividend is being paid compared with 5 per cent. previously. Main cause of the loss, states the chairman, Mr. A. S. Beech, is the difficulty experienced in endeavours to expand the export trade.

Joseph Lucas (Industries), Limited—Net profit for the year ended July 31, 1961, is £2,526,350 (£2,923,424), and directors recommend a final dividend of 2s. 3d. a share on the ordinary and redeemable preference, which, with the interim, makes 2s. 9d. for the year, as previously. Export business during the year reached a record turnover, despite the setback to vehicle exports generally, and increasing competition.

Duport, Limited, ironfounders, engineers, etc., of Tipton (Staffs)—Shareholders are warned that unless trading conditions begin to show an improvement in the relatively near future, the ordinary dividend may have to be reduced. The chairman, Mr. W. L. Barrows, states that the cost of the new bar mill will have to be financed by raising new permanent capital but as times are not propitious for this step, arrangements have been made with the bank.

Thomas Blackburn & Sons, Limited, constructional engineers and ironfounders, of Preston—Orders in hand for 1961-62 considerably exceed comparable figures for the previous year, and current production shows a similar improvement, state the directors. Trading profits in the year ended June 30, 1961, amounted to £52,687, compared with £22,505 previously, when the balance was increased by £37,997 net credits related to prior years.

Metal Traders, Limited, non-ferrous metal and ores merchants and brokers, of London, E.C.3—In his statement, the chairman, Brig. H. P. Crosland, explains that in spite of expert advice and considerable reorganization the improvement hoped for last year has not materialized in respect of the subsidiary, Watford Foundry Company, Limited. As further mechanization, requiring large capital expenditure, was needed to make the factory competitive, and this did not seem justified production of iron castings ceased from October 31.

Birmid Industries, Limited, manufacturers of alloys and castings, etc., of Smethwick (Staffs)—It seems unlikely, says the Marquess of Exeter, the chairman, that the present falling off in demand from the motor and other consumer industries will improve before the New Year. In certain directions the number of employees has been reduced and short-time working was recently introduced in several foundries. Competition for available business is keener than ever before, so that in order to secure contracts, profit margins will have to be drastically reduced.

Gas Purification & Chemical Company, Limited—It is proposed to set up a management committee of three directors from the parent board, headed by the chairman, which will make recommendations on co-ordination, expansion, acquisitions, and capital expenditure and if, when thought fit, the elimination of companies in the group where the results are not considered satisfactory, having regard to the capital employed and no expansion is considered practicable.

Stanley Works (Great Britain), Limited, tool-makers, Sheffield, have agreed to purchase in cash from John Brown & Company, Limited, and from the minority shareholders, all the shares of S. N. Bridges & Company, Limited, portable power-tool manufacturers. The announcement by Mr. Howard L. Richardson, president of Stanley Works, United States, and Lord Aberconway, chairman of John Brown & Company, Limited, stated that the purchase was subject to the necessary consent being obtained. The products of S. N. Bridges & Company will continue to be made and marketed under their own name, and the management will continue in office under the present managing director, Mr. G. N. Bridges, who was founder of the business. Further additions to the board of directors will be announced.

Mr. A. E. Thornton retires

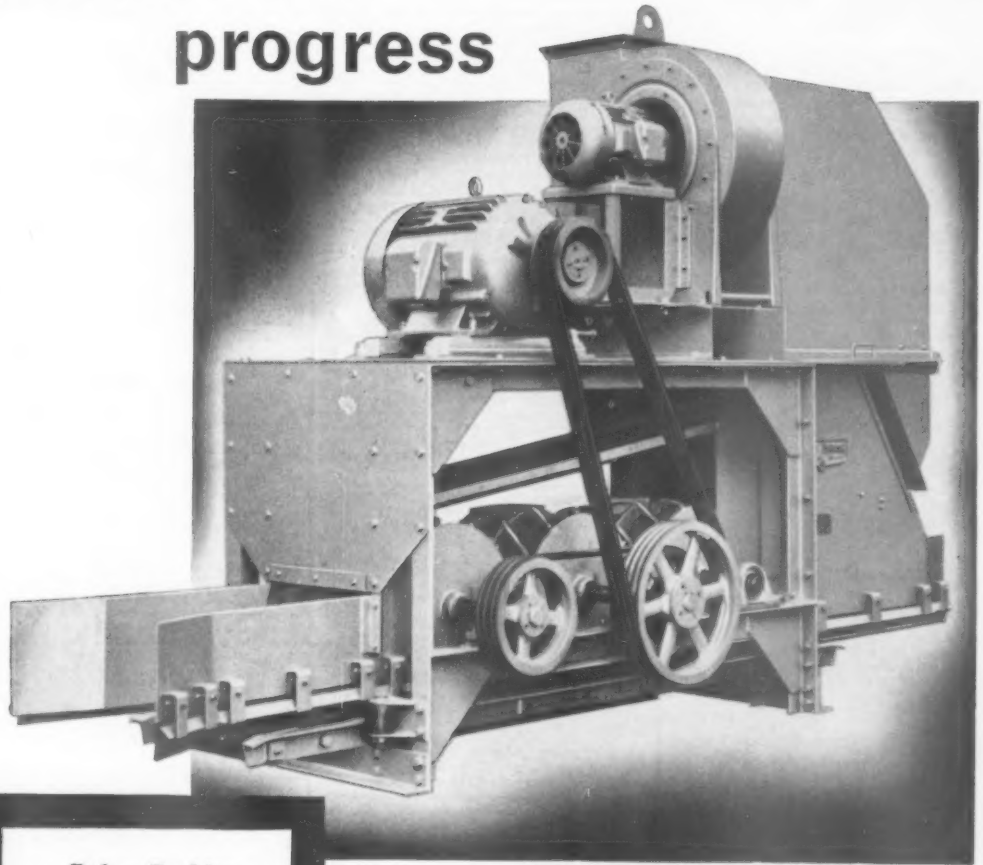
Mr. A. E. Thornton, special director and foundry general manager of Firth-Vickers Stainless Steels, Limited, Sheffield, is retiring on December 31 on medical advice and at his own request. He has been with the company and its parent company, Thos. Firth and John Brown, Limited, for 45 years. He received metallurgical training under Dr. W. Hatfield at the Brown-Firth research laboratories, and took an associate degree in metallurgy at Sheffield University. Later, he specialized in the process development and manufacture of stainless and heat-resisting steels as technical assistant to the works director at Firth-Brown. He was seconded to Firth-Vickers at the beginning of the second world war and was general manager of the group's foundries in Sheffield, Birmingham and Barnsley. He became a special director in 1946. For his work in the development and manufacture of special steels for the aircraft industry—particularly the Bristol sleeve-valve and turbo-jet engines, he was awarded the Associate Fellowship of the Royal Aeronautical Society.

Mr. Thornton is a past-president of Sheffield Junior Chamber of Commerce and is a member of Council of Sheffield Chamber of Commerce and chairman of its education committee. He is also a member of Sheffield Education Committee, and chairman of the West Riding and North Derbyshire Area Training Committee of the British Iron and Steel Federation.

Borough Polytechnic Courses

Borough Polytechnic, Borough Road, London, S.E.1, announce a series of lectures covering *inter alia* "Modern Developments in Die-casting Practice." There are to be four lectures, given by specialists, on consecutive Wednesday evenings at 7 p.m., commencing March 7, 1962. The fee for the course is 10s.

pattern for progress



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PREPAID RATES: **Twenty words for 10/- (minimum charge) and 4d. per word thereafter. Box numbers 2/6 extra per insertion (including postage of replies). Situations wanted 2d. per word throughout.**

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House, 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Monday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

FOUNDRY MANAGER (52), well educated, practical, technical, commercial, jobbing, mechanized, ferrous, non-ferrous, whiteheart, malleable experience, all life foundry trade, requires position West Midlands at once. Excellent references, loyal and efficient, keen, reliable. Available due ownership change. Box FM228, FOUNDRY TRADE JOURNAL.

A METALLURGIST IS OPEN TO SUGGESTIONS being laboratory trained and having held EXECUTIVE POSITIONS IN FOUNDRIES since 1957. Experience having been gained with all grades of cast iron and alloy irons including nodular. Using electric melting furnaces and hot blast cupola. Would prefer the West Riding of Yorkshire area but consider other locations. Car owner, H.N.C. Metallurgy engineering background. Any proposition received will be considered and treated in the strictest confidence. Box AM231, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

FOREMAN for small iron foundry producing machine tool castings up to 3 tons. Only men with first class record of quality control considered. Pension scheme, assistance with housing. West Riding area. Box WF226, FOUNDRY TRADE JOURNAL.

OPERATOR required in New Year to take charge of small High Frequency Furnace, melting stainless steel. Some metallurgical knowledge essential, but would be prepared to train in use of high frequency furnace if necessary. New foundry near centre of Birmingham. This post offers particularly good prospects to right man. Please write giving fullest details. Box OR230, FOUNDRY TRADE JOURNAL.

YOUNG METALLURGIST required to take over duties of CHIEF CHEMIST in a Steel Foundry. Experience in metallurgical analysis essential, knowledge of physical testing methods and radiographic technique an advantage. Minimum qualification H.N.C.

Write, stating age, qualifications, and experience to: PERSONNEL MANAGER, JOHN FOWLER & Co. (LEEDS), LTD., Sprotborough Works, Doncaster.

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EXPERIENCED established representative with good sales record, able to discuss casting requirements at top level—advise on suitability of design—sand and gravity die casting. This is a monthly staff appointment—pensionable after one year's satisfactory service. Only top men of proven ability need apply. Car provided. State salary required. Reply in confidence to SALES DIRECTOR, H. J. MAYBREY & Co. LTD., Worseley Bridge Road, Lower Sydenham, London, S.E.26.

SITUATIONS VACANT—*contd.*

EXPERIENCED CHIEF METALLURGIST, FOUNDRY SUPERINTENDENTS (two) and PROCESS METALLURGIST required for large steel and iron foundries in South America. Familiarity with automobile castings production and the newer processes desirable. Contracts for 3/5 years or permanencies. Excellent service conditions, including passages, home leave, etc. Box EC239, FOUNDRY TRADE JOURNAL.

FOUNDRY SUPERINTENDENT required by East Midlands Jobbing Ironfounders having approximately 100 employees. The successful applicant must have both supervisory and technical experience coupled with a high degree of drive and initiative. Permanent position with good promotion prospects. Preferred age group 25/35. Full details in confidence to MANAGING DIRECTOR, Box FS236, FOUNDRY TRADE JOURNAL.

SHEEPBRIDGE ALLOY CASTINGS LTD., Hamilton Road, Sutton-in-Ashfield, Notts, have a vacancy for a REPRESENTATIVE to cover Lancs/Cheshire/Westmorland and Cumberland selling iron, carbon steel and stainless steel castings. Please write giving details of past experience, salary required, etc., to PERSONNEL MANAGER.

WORKS MANAGER wanted, under 45 years, for Whiteheart Malleable Foundry, West Midlands. Mechanised moulding unit, stump moulding, core shop, cupola melting, oil fired annealing. Give full career and salary. Apply Box WM233, FOUNDRY TRADE JOURNAL.

REPRESENTATIVE required in Birmingham and Midlands Area by old established firm of Malleable Iron Founders. Good personality essential—and knowledge of the Industry desirable though this is not of first importance. Applications should be addressed to: THE SECRETARY, WILLIAM LEE & SONS, Dronfield, Near Sheffield.

COUNCIL OF IRONFOUNDRY ASSOCIATIONS

EDUCATION AND TRAINING

The Council is expanding its Training Services to the industry and invites applications for the appointment of an

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The appointment is mainly concerned with the organization and supervision of management and supervisory courses, general and technical, which are being rapidly expanded to meet the industry's demands, and to assist the Head of the Section generally. There will be a considerable amount of travel within the U.K.

Candidates should preferably be under 35 years of age and hold a degree or N.F.C. Diploma or similar technical qualification. Knowledge of the ironfoundry industry and teaching ability and experience would be an advantage.

The appointment is based in London and a salary appropriate to qualifications and experience plus excellent pension scheme is envisaged.

Forms of application can be obtained from the Head of the Education and Training Section, 14 Pall Mall, London, S.W.1.

SITUATIONS VACANT—*contd.*

FOUNDRY ENGINEER, 30-40, National Foundry College trained; A.M.I. Mech.E. or equivalent an advantage. Practical foundry experience essential. To assist in engineering and implementing foundry and allied materials handling projects.

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is required to control a self-contained unit producing rods in copper base alloys. As mechanical casting methods are employed an engineering background and experience in the planning of production schedules are necessary.

Reply with details of experience, salary required, to **BOX WM 225, Foundry Trade Journal.**

ASSISTANT FOUNDRY MANAGER required for jobbing Foundry making castings up to 20 tons. The position offers scope for improvement and the duties will be mainly the setting out of moulding and coremaking operations and time control of same. Applicants must have had good practical experience of moulding and coremaking although the position will be fully supervisory. Must have had previous experience as a Foreman or Manager. Age group approximately 40/45 years. Manchester Area. Box AF227, FOUNDRY TRADE JOURNAL.

PATENTS

THE proprietor of the British Patent No. 781233, entitled "Blast furnace cooling plate holder," offers same for license or otherwise to ensure practical working in Great Britain. Inquiries to SINGER, STERN & CARLBERG, 140 So. Dearborn Street, Chicago 3, Illinois, U.S.A.

THE Proprietor of Patent No. 699318 for "A Regenerative Refractory Furnace for Endothermically altering a Gaseous Material," desires to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to Haseltine Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

AGENTS

MANUFACTURER'S AGENT with wide connections in foundries and engineering works is seeking a few more lines. Commission basis. Box MA212, FOUNDRY TRADE JOURNAL.

HELP in your Foundry. CONSULTANT with 30 years' experience, Metallurgical and practical, can now accept new clients in Lancs, Yorks, Cheshire, North Midlands. Box HI211, FOUNDRY TRADE JOURNAL.

AGENTS—*contd.*

MASTER PATTERNMAKERS in Lancashire, with good connections, seek agency to sell Foundry Requisites and Steel Castings, etc. Commission basis. Box MP238, FOUNDRY TRADE JOURNAL.

GREY IRON FOUNDRY in Midlands requires AGENT in London area to obtain Orders for light repetition castings. Commission basis. Box GI189, FOUNDRY TRADE JOURNAL.

GREY IRON FOUNDRY in Midlands requires AGENT in London area to obtain orders for light repetition castings. Commission basis and expenses. Box GI240, FOUNDRY TRADE JOURNAL.

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SMALL Aluminium or Non-ferrous Foundry wanted in Midlands area. State details to Box SA224, FOUNDRY TRADE JOURNAL.

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SMALL Non-ferrous Foundry Business and Freehold Premises, East Midlands, for sale. Established 1927. Owner retiring. Box SN198, FOUNDRY TRADE JOURNAL.

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SAND MILL required, 5/6 tons per hour capacity, in good condition. Preferably with bucket loader. Box SM229, FOUNDRY TRADE JOURNAL.

PENDULUM TYPE Conveyor required for use in Foundry Core Shop, suitable for handling 24 in. × 24 in. core plates. Write stating price and conditions to Box PT204, FOUNDRY TRADE JOURNAL.

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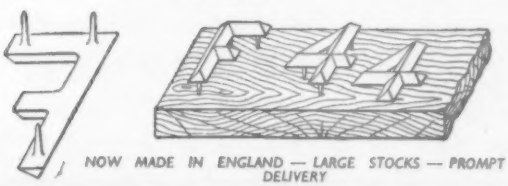

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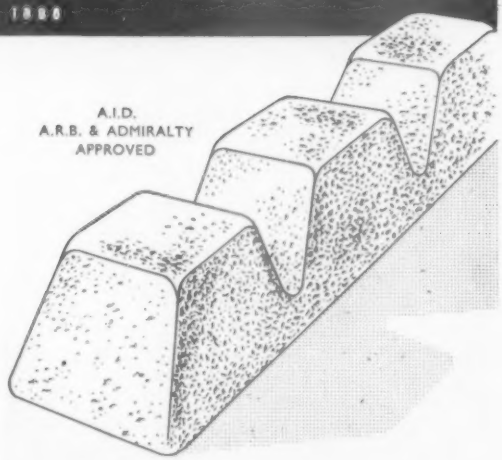

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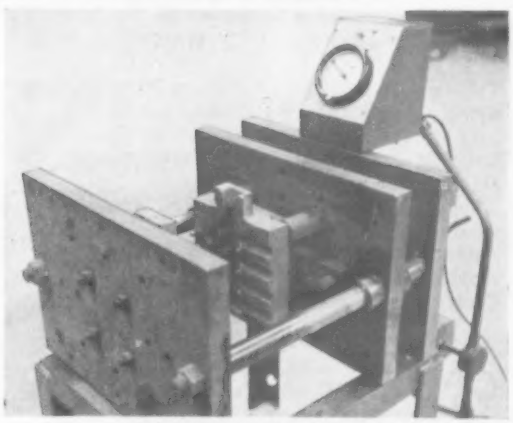

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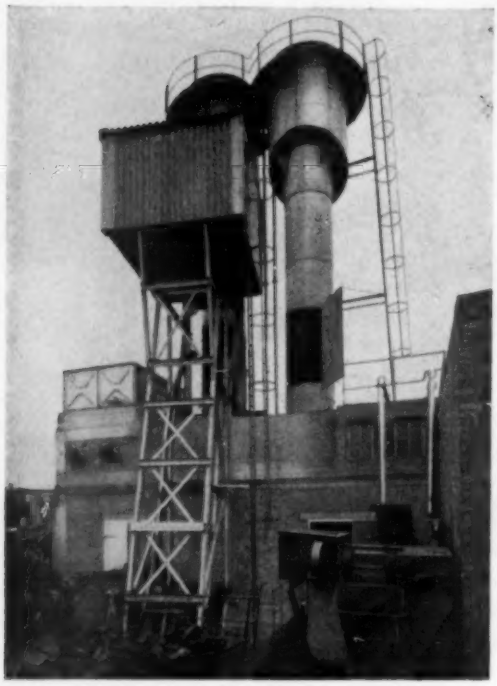

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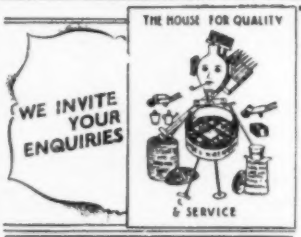

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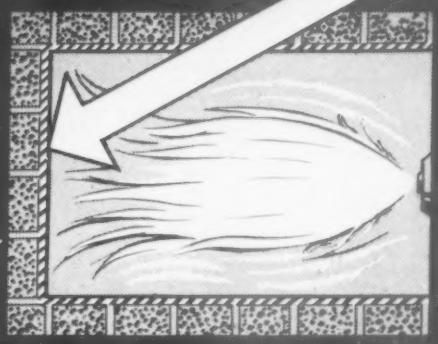

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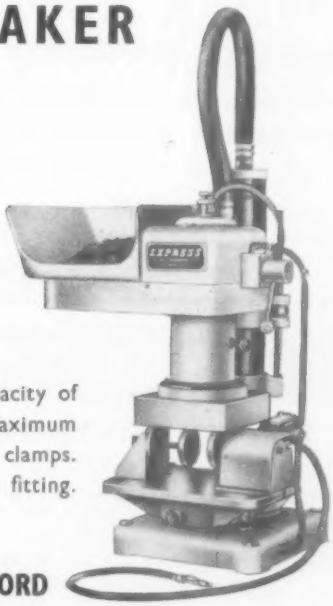

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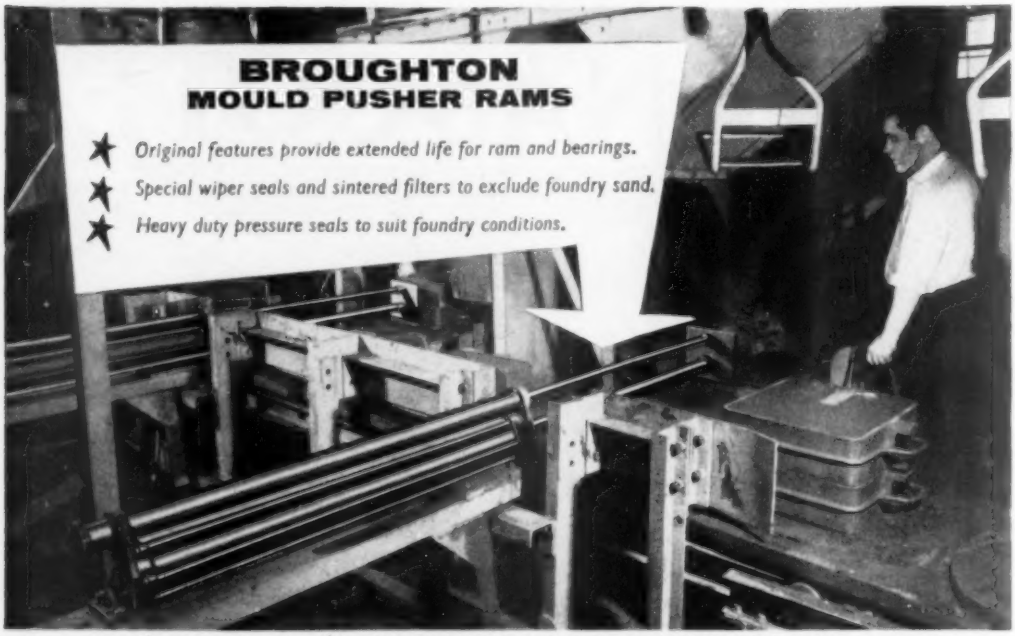
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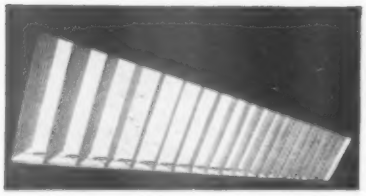

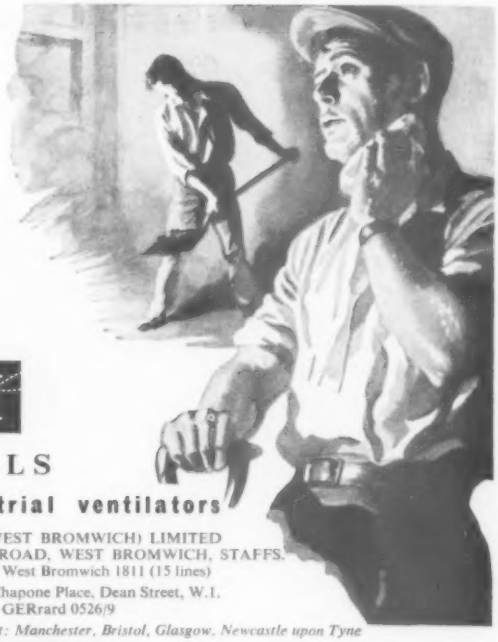

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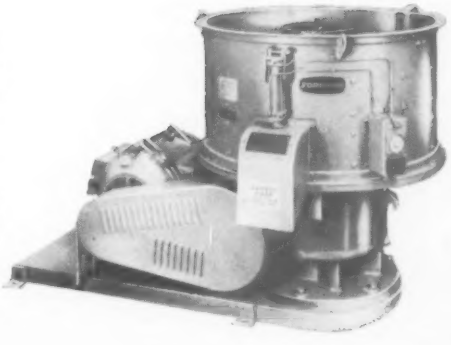

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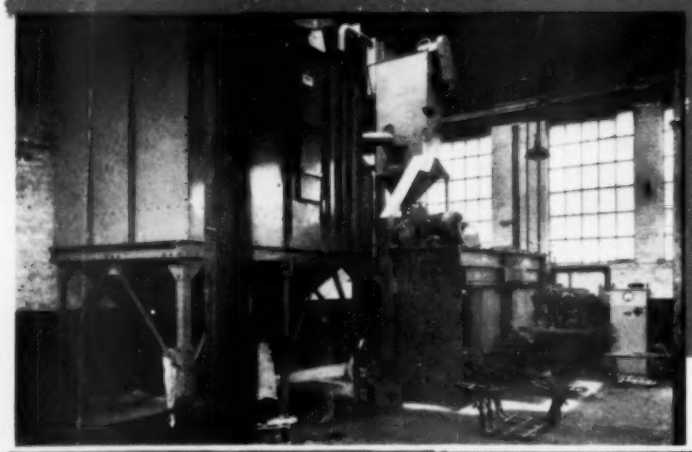

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